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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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DECORATION OF FIREPLACE IN REPOUSSÉ WORK, TILES, OR PAINTING.

BY J. EADIE-REID.

THE designs for panels to be used in the decoration of a fireplace which are here submitted to the notice of our readers, although they are intended primarily for execution in copper, are equally adapted to reproduction in tiles or painted decoration.

The drawings themselves are intended rather as suggestions to the workman than as actual copies. In carrying out such a design, I would advise the designer to work it carefully on a small scale—say, inch scale—determining the place of every detail before commencing his full-size cartoon. By acting on this hint he will save much time and patience. For painted decoration I would use some simple harmony of contrasting colour, outlining the principal forms with a rich dark brown. The ornament will require a similar treatment. Whatever method may be adopted in carrying them out, see that there is breadth in your masses and clearness in the drawing of your forms.

The figures, as will be noticed, represent Summer and Winter, and may be taken as being fairly characteristic of these seasons of the year. They will be found useful for the ornamentation of articles of furniture and other things, as well as the decoration of a fireplace. Thus, for instance, they may be utilised for painting the panels of the doors of a sideboard, or for windows in painted glass, or pieces of glass that are often seen hanging in windows. A clever decorator will be at no loss as to any use to which they may be put.

Design for Decoration of Fireplace in Repoussé Work, Tiles, or Painting.

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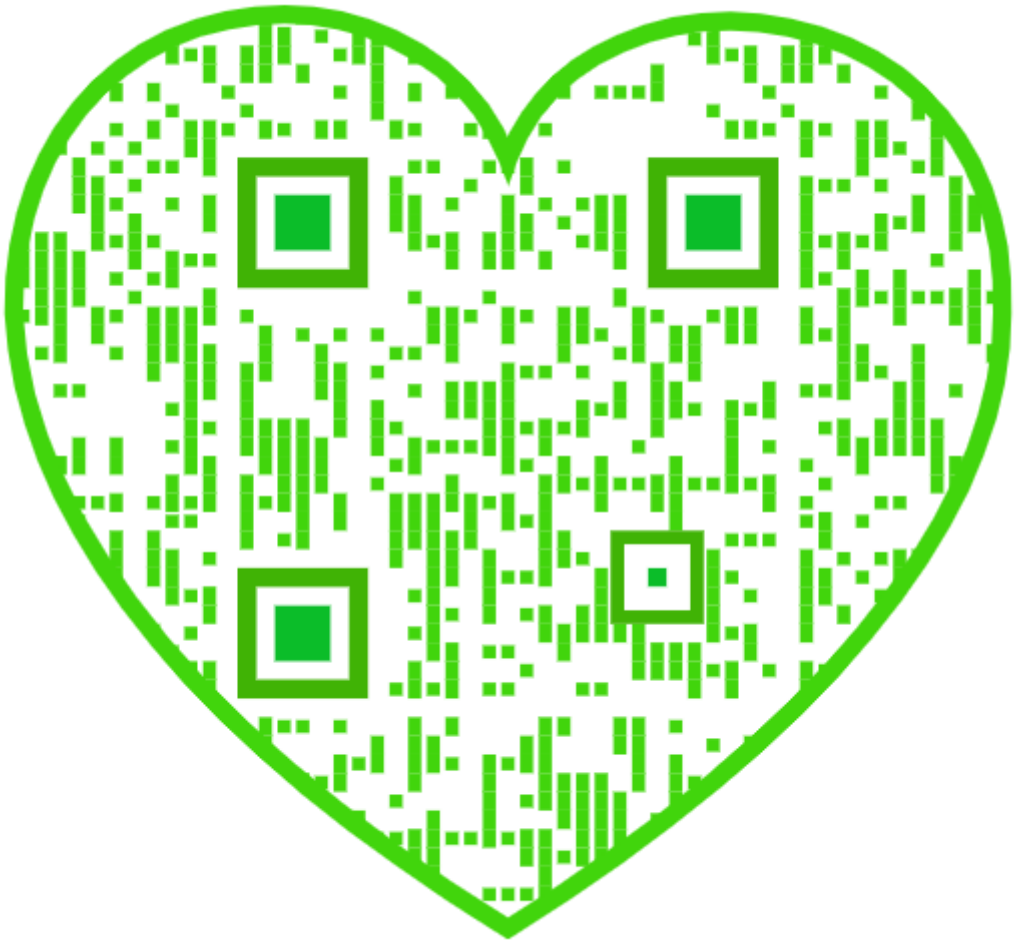

THE WINTER ELECTRICAL MACHINE AND ACCESSORY APPARATUS.

BY CHAS. A. PARKER.

SLOW DISCHARGE OF LEYDEN JAR—ELECTRICAL CHIMES—IMAGE PLATE—STAND FOR DANCING FIGURES—INSULATING STOOL—ELECTRIFIED HEAD OF HAIR—BUTTERFLY NET—ELECTRICAL WHIRL—ELECTRICAL INCLINED PLANE—LUMINOUS EGG STAND—APPARATUS FOR FIRING ETHER—FIRE HOUSE—THUNDER HOUSE—VARNISH.

IN the previous article description was given of an arrangement whereby a Leyden jar might be slowly and imperceptibly discharged automatically. By the following slight modification of the apparatus previously described, this slow discharge of a Leyden jar may be made the means of ringing a couple of bells until the charge is finally exhausted, as will be understood by reference to Fig. 34, which is an illustration of the apparatus about to be described.

Slow Discharge of a Leyden Jar by means of Bells.—First prepare the wooden base, which may take the form of a mahogany board, 9 in. by 12 in., supported on four feet. These feet may be turned in a lathe similar to the supporting feet of the machine previously illustrated in Fig. 18 (p. 465); but they must, of course, be smaller, or, if preferred, they can be sawn from a suitably moulded piece of mahogany, cut in the form of Fig. 35. When the stand has been prepared, it should be polished or varnished, according to taste, after which a disc of foil, a trifle larger than the jar to be employed, is pasted on to the upper surface of the stand near to one end, with a 4 in. narrow strip of foil projecting from one side of the disc across the base to nearly the opposite end, as will be seen by reference to Fig. 36, which represents a plan of the top of the stand. A turned wooden socket, about 1 in. in diameter and 1½ in. or 2 in. high, is now prepared and affixed to the stand immediately over the outer end of the strip of foil. When this has been done, a 10 in. length of stout brass wire should be pointed at one end slightly, and then bent to the form of a hook, with a smaller hook turned up at the extreme point, something afer the fashion of a shepherd's crook. Now procure a couple of small bells, such as are used on alarum clocks, and slide one of these on to the wire support just prepared, holding it near to the curved end whilst a small brass ring is being soldered to the middle of the wire, in order to retain the bell in position. Thus prepared, the wire is tightly fitted and cemented into a hole bored through the small socket, after which a small ball of metal is suspended from the hook of the support by means of a silk thread. The stand being completed, the second bell is now supported on the stem of the Leyden jar at a corresponding height to the other, by means of another wire ring soldered round the stem in a similar manner to the previous one. If the jar is now charged and then placed on the table over the circular disc of foil, it will attract the small clapper, and cause the latter to swing backwards and forwards, ringing the bells until the charge is exhausted.

The Electrical Chimes (shown in Fig. 37) will be found a much more convenient method than the foregoing for illustrating the phenomena of attraction and repulsion as applied to bells. A 6 in. length of brass rod is first bent into the form of a hook at either end, in order to form the cross-bar from which to suspend the bells, and another piece of slightly thinner wire is then twisted in a loop in the middle, and bent in the form of a hook at either end, of sufficient size to grip the central bar just prepared, after which the two are joined together by means of a touch of soft solder. Now cut off a couple of 7 in. lengths of moderately stout brass wire (or brass chain), and having first turned up one end of each in the form of a small ring, slip one of the bells previously mentioned on to the wire, so that it may rest on this ring, and then turn up a similar loop at the other end of the wire, but do not close this until the bells have been slipped on to the end of the cross-bar. The bells are shown suspended by chains in Fig. 37, and A represents the alternative plan above described. For the clappers, a small block of brass about ⅜ in. long is filed up to a neat form, and then threaded on a piece of silk, which is put through a hole drilled in the metal. Thus prepared, a third bell is suspended from the centre of the cross-beam by means of a piece of silk thread tied to the latter, and from the underneath of this bell, a suitable length of brass chain should be hung, in order to make provision for the escape of the electricity into the earth. Lastly, the two clappers are hung from the cross-beam, one on either side of the central bell, and midway between the others, care being taken to see that the bells and clappers are all on the same level. The bells are now hung from the prime conductor, with the piece of chain from the centre bell in communication with the earth. On the machine being put in motion the outer bells will become charged with electricity, which will attract the two clappers, and cause them to fly backwards and forwards from the centre to the outer bells during the time that the machine is worked. Any dealer in watch and clock makers' materials will be able to supply small alarum clock bells, similar to those shown in the illustration, for a few pence.

The Image Plate, for dancing figures, represented in Fig. 38, is a very amusing piece of apparatus for exhibiting the effects of attraction and repulsion by means of a couple of small pith figures. The usual description of image plate takes the form of a pair of thin discs of tin or brass plate. The top one is suspended from the prime conductor by means of a short length of chain attached to a hook or collar soldered to the plate, and the lower disc, which is called the table, is supported on an ornamental turned wooden pillar, provided with a circular base. The figures employed for the purpose are carefully cut from elder pith by means of a keen knife or razor, being afterwards painted in as life-like a manner as possible.

A Stand for Dancing Figures, which is far preferable to the above, is illustrated in Fig. 39. A piece of mahogany about 12 in. square is carefully planed and moulded to form the base, which should be slightly raised from the table by means of four mahogany supporting feet. A couple of ¾ in. holes are now bored through the base on opposite sides, in order to receive the stems of a couple of sockets for the supporting rods. These supporting rods take the form of two short lengths of glass rod, ⅝ in. in diameter, cemented into a pair of suitably turned wooden sockets, which are furnished with short projecting pins, in order that they may be fitted into the holes prepared for their reception in the base. A couple of hollow brass stool balls, which will just fit over the tops of the glass rods, are now soldered to the ends of a 12 in. length of stout brass wire, which is afterwards bent in the form of a loop round a perfectly sound cork, in the manner shown in Fig. 39. When this has been done, a 9 in. disc of tinfoil is very carefully cut and pasted on the centre of the base in the position indicated in the illustration, after which the sockets carrying the supporting pillars should be glued into the holes in the base, and the knobs of the wire arch afterwards cemented on to the tops of the glass pillars. A 3 in. or 4 in. brass disc is now soldered to the end of a 6 in. length of brass rod, which is then pushed through the cork fitted into the central loop of the arched wire, after which a small brass knob is soldered on to the upper end of the brass stem, and when quite finished this apparatus may be varnished or polished, according to taste. By means of this arrangement the upper plate can be readily adjusted to suit any kind of pith figures or pith balls, and if desired may be worked at some distance from the machine by means of a chain led from the prime conductor and hooked on to the upper knob of the stand.

The Insulating Stool, illustrated in Fig. 40, will be found a very useful accessory for use when it becomes necessary to insulate any large conducting body. For the table top of the stool prepare a board of sound dry mahogany, to measure about 12 in. by 10 in., and 1 in. or 1½ in. thick. It will be found to add greatly to the appearance of the stool if the edges of the board are moulded by means of a moulding plane. Exact measurements are not important, but the above size of top will be found very convenient for all ordinary purposes. When the top has been prepared, four wooden sockets will be required to receive the glass supporting legs, each of them measuring outside about 2 in. in diameter and 1½ in. thick, with an internal diameter of ⅝ in. As soon as the sockets are ready, they should be glued and secured to the under-side of the top, after which a 6 in. length of ¾ in. glass rod may be cemented into each one by means of electrical cement or a mixture of plaster of Paris and glue. Before cementing the glass rods into the sockets, it will be necessary to round off the lower ends of each one on a grindstone, afterwards levelling the stool carefully, and lastly polishing or varnishing the woodwork.

The Electrified Head of Hair, shown in Fig. 41, takes the form of a small wooden doll's head, which is cut off short at the neck, and mounted on a brass stem inserted through the neck well into the brain—that is to say, the cranium. A knife slit is now made across the middle of the head, and the slit having been filled with glue, a hank of coarse hair is folded over a piece of card and inserted in the groove. The stem of the rod is made to fit into a hole in a turned wooden base, on which the head may be supported when not in use. If the head is fixed into the prime conductor by means of the metal stem, and the machine is put in motion, it will cause the hair to stand on end, as if with fright.

The Butterfly Net of Professor Faraday, represented in Fig. 42, is a very useful appliance for demonstrating the diffusion of electricity over the surface of a conductor. A piece of tolerably stout brass wire is bent into the form of a ring about 4 in. in diameter, with about 2 in. of wire projecting in order to form a stem, which is now cemented into a 6 in. length of glass tube of small bore, in order to insulate it; after which the glass rod is cemented into a convenient turned wooden supporting base. Thus prepared, a piece of starched book muslin is now cut and sewn into the form of a small conical bag, about

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8 in. in length, which is then sewn on to the brass ring of the supporting stand, being finally completed by attaching a couple of threads of silk (each about 12 in. in length) to the apex of the bag. These threads should be arranged one either way, one inside and the other outside, as will be seen by reference to Fig. 42.

The Electrical Whirl, shown in Fig. 43, will be found very useful for exhibiting the phenomena of repulsion. From a circular disc of very thin sheet brass, mark and cut a cross to the exact form of Fig. 44, being particular to see that the extreme points are quite sharp. A slight depression is now made in the exact centre of the metal in order to form the axis upon which it turns, and each arm should be slightly bent out of the flat near the centre, in the manner shown in Fig. 43. Thus prepared, the whirl may be supported on the point of a darning-needle fitted into the prime conductor of the machine. Upon the plate being put in motion it will cause the whirl to turn round on the point of the needle, in consequence of the electricity being rapidly given off from the points.

The Electrical Inclined Plane is a slight modification of the above, which forms a very interesting piece of apparatus of simple construction, as will be seen by reference to Fig. 45. A good sound piece of dry mahogany should be suitably planed and moulded to form a base 12 in. by 6 in., which is then mounted on four turned wooden feet, or the moulded supports previously described. A couple each of 4½ in. and 3 in. lengths of ½ in. glass rod are now cemented into small turned wooden sockets provided with short projecting pins, after which they are glued into holes bored for their reception by use of a suitable centre-bit at the four corners of the baseboard, the pillars being located in pairs at either end of the base. A hollow brass ball of fair size is now cemented to the upper end of each of the glass pillars in order to form a cap, and a couple of pieces of stout brass wire (perfectly straight) are then stretched from end to end of the base by being sprung into holes drilled for their reception in the inner faces of the brass balls. The whirl is cut from a piece of thin sheet brass, the same as before described, but in this instance it will require to be soldered to the centre of a perfectly straight piece of tolerably stout brass rod, the two outer ends of which should be provided with a small brass ball soldered to them. Upon the insulated glass knobs being connected with the machine, with the whirl arranged in the manner shown in Fig. 45, the latter will be seen to slowly roll up the inclined plane when the machine is put in motion.

The Luminous Egg Stand, which is illustrated in Fig. 46, forms a very useful and convenient support for eggs when a charge of electricity is passed through them. A sound dry mahogany base is first prepared to measure about 6 in. square, being provided with four supporting feet in the usual manner, after which a couple of 7½ in. lengths of wood, ½ in. square, are mortised into the stand on opposite sides, with a cross-bar of the same thickness over the top. A stout piece of wire, bent to the form of Fig. 47, is now tightly fitted into a hole bored for its reception in the middle of the cross-bar, a small brass knob being afterwards soft-soldered to the outside end of this. Another length of the same wire is now pointed at one end and then bent in the form of a ring at the other extremity, with a small loop near to the pointed end, similar to Fig. 48, and when ready, the point is driven securely into the baseboard immediately under the cross-bar. We shall now be ready for the supporting discs for the eggs, which may be sawn from a portion of a cigar-box cut to an oval form, with a 1½ in. circular opening in the centre of each, and a small slot the width of the uprights at either end, as shown in plan in Fig. 49. A small piece of wood is now nailed and glued to the inside of each upright in a suitable position to support the shelves at an equal distance from each other. The first egg put into the stand is supported on the lower connection with a shelf brought down over the top of the egg in order to retain it in position, after which the second and third eggs are arranged in a similar manner with the upper conducting-rod brought down on the top of the upper egg. A chain in connection with the outer coating of the jar or battery is now suspended from the loop of the lower conducting wire, with a director attached to the upper conducting stem by means of another length of chain. Upon the latter being brought in contact with the inner coating, the charge will pass through the eggs, which are rendered luminous during its passage, presenting a novel and beautiful appearance if the experiment is performed in a darkened room.

The Apparatus for Firing Ether, which is shown in Fig. 50, is very useful for demonstrating the inflammable effects of the discharge. For the base, a piece of sound dry mahogany, measuring about 7 in. by 5 in., is carefully planed up on the face and edges, and then mounted on four small supporting feet, after which a ¾ in. hole is bored through the wood at either end to receive the pins of the sockets which support the glass pillars. A 4 in. length of ½ in. glass rod is now cemented into a small turned wooden socket, which is provided with a short projecting pin, in order to allow of its being fitted and glued into one of the holes in the base. When this has been done, another 3 in. length of ½ in. glass rod is next cemented into a similar socket, which is then glued into the hole at the other end of the stand. A small metal saucer to contain the ether must now be attached to the upper end of the shorter glass pillar. For this purpose an ordinary small size mince-pie tin will be found to answer very well. A slight depression should be made in the centre of the under-side by means of a punch, in order to mark the path to be taken by the spark, after which a small piece of tin, bent in the form of a collar, of sufficient size to pass over the glass rod, should be soldered to the under-side of the saucer, thus forming a socket by which the latter may be cemented to the glass support. It will be necessary for a small hook to be soldered to the under-side of this collar, from which to suspend the conducting chain, or if preferred, the collar may be formed by bending a strip of tin round the glass rod and then punching a hole through the two ends, which are afterwards brought together and soldered, thus forming a socket similar in appearance to Fig. 51. The saucer being finished, the other glass rod must now be provided with a gas-fitter's brass cap, which is soldered to one end of a short length of stout brass rod, a small brass ball being affixed in a like manner to the other extremity, after which a brass hook is soldered to the back of the cap in order to make provision for the connecting chain, as will be seen by reference to Fig. 52. The cap, with the arm attached, is now cemented on to the end of the glass support, with the arm curved over in such a manner that the ball will come immediately over the depression in the ether saucer and within sparking distance. When in use, a piece of chain in connection with the outer coating of a charged Leyden jar is hooked on to the under-side of the saucer, and another length is suspended from the bent arm and attached to a director. Thus arranged, a few drops of ether are poured into the saucer at the last moment, and the ball of the director is rapidly brought in contact with the knob of the Leyden jar, which will thus cause a spark to pass and inflame the ether. The ether should be kept in a tightly corked bottle, and only poured into the saucer at the last moment, as it is extremely volatile.

The Fire House, illustrated in Fig. 53, is a very effective modification of the apparatus just described, in which the ether is enclosed within a small wooden representation of a house or cottage. A small model of a dwelling-house or shop is first procured from a toy dealer, and a brass knob and stem are then arranged to lead from the chimney-stack into the interior of the dwelling, where it terminates in another brass knob. A small shallow tin saucer, similar to the one used for the last piece of apparatus, is now soldered to a suitable length of brass rod, which is inserted in a hole in the side of the house, and then bent in the form of a hook outside, as will be understood by reference to Fig. 54, in which the front of the house has been removed, thus showing the interior arrangements. Thus prepared, a piece of cotton-wool, saturated with ether, is placed in the saucer, with the upper rod brought down over the saucer until within sparking distance. A short length of chain is now hung from the outside hook, and placed in contact with the outer coating of the Leyden battery, after which another length of chain is hooked on to the knob of the chimney and attached to the director. On the latter being placed in contact with the inner coating of the Leyden jar, it will cause a spark to pass which inflames the ether and produces the effect of a house on fire. The front, back, or one of the sides of the house must be removable, in order that access may be gained to the interior.

The Thunder House, shown in Fig. 55, is a similar piece of apparatus to the foregoing, but is employed for the purpose of illustrating the necessity for lightning conductors. In appearance the thunder house takes the form of a long, low building, with a factory chimney. For the two ends, plane up a couple of boards to measure 4 in. wide and about 6 in. in height from base to apex, and then prepare a couple more boards to form the sides, measuring about 9 in. by 4 in. each. Two more pieces will also be required for the sloping roof, each measuring 9 in. by 2¾ in. One of the long sides of each of the latter will now require to be bevelled on the inside, in order that the roof may join together close along the edge. Thus prepared, the building may be put together with glue and brads, with the two pieces forming the roof placed just below the edges of the sides and ends, thus forming a slight parapet, as shown in Fig. 55. The factory chimney is now turned in a lathe from a piece of sound dry mahogany, to measure, when complete, about 10 in. long and 1½ in. square at the base, tapering to 1 in. at the top. One side of the base must now be cut off at an angle, in order to adapt it to the slope of the roof, to which it is then glued near to the end of the building, in the position shown in the cut. Three or four small windows must now be painted along the sides of the building, and one of these,

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immediately under the chimney, must be pierced by means of a fret- or keyhole saw. A small wooden shutter (A) is now made to fit loosely into the aperture thus formed in such a manner that a slight touch will cause it to fall out, the woodwork surrounding the aperture being bevelled inwards, so that the shutter will always fall outside. A length of brass wire is brought from the top of the chimney along the wall of the building until it reaches the open aperture, where it is continued in a diagonal line across the shutter, after which it is carried to the ground from the lower corner of the aperture, terminating in a small loop or hook. It should be affixed to the woodwork by means of short lengths of brass wire pointed at either end, and bent in the form of small horse-shoe staples, which are driven into the wood over the wire. The upper end of the lightning conductor, as it may be called, should terminate in a small brass ball, which may be soft-soldered to the end of the wire. When the building is ready for use, the shutter is pushed into the aperture of the window, with the diagonal wire in conducting communication with the remainder of the wire. The hook at the base of the building is now connected with the outer coating of the Leyden battery, and another similar chain is brought from the knob at the top of the chimney to a director. Upon contact being made in the usual manner, the charge will pass without disturbing the shutter, but if the experiment is repeated in the same manner, with the shutter placed in a reverse position, so that the contact is broken, it will cause the shutter to be violently thrown out.

The above form of apparatus may be made in a more simple form by cutting a piece of mahogany to represent the gable end of a house, and then mounting this in a vertical position on a substantial base. The upright board is now pierced with a couple of apertures, and fitted with shutters and conducting wires in precisely the same manner as above described.

Shellac Varnish.—As the ordinary glass supports used for electrical apparatus are almost invariably bad insulators, it becomes advisable to coat them with shellac varnish, which will effectually prevent the condensation of moisture upon the glass, owing to shellac being a first-class insulator. A useful shellac varnish for this purpose may be made by pouring bulk for bulk of methylated spirit on to shellac of good quality, which is placed in a tolerably warm place for about a day, being well shaken occasionally until dissolved, when it should be diluted with two or three times as much spirit, and then bottled ready for use. Ordinary shellac varnish, sold by shops, forms an excellent insulating varnish, provided that it is of good quality. It is also possible to obtain this in a bleached form, which will be found a great advantage when it is required for glass work. The varnish should be applied to the surface of the article previously warmed, otherwise, if it is applied to a cold surface, it will form a dull whitish film; but on the other hand, the glass should not be sufficiently hot to cause the varnish to bubble and hiss, or the glass will be apt to crack. The brush should only be drawn once across the surface whilst the varnish is moist, otherwise the previous coat will be dragged off.

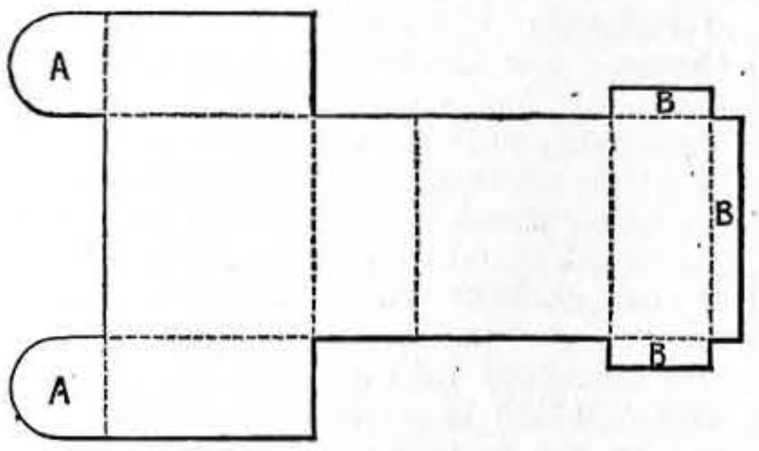
The illustrations to this paper are placed on a right-hand page, as in this position they are more convenient for reference when reading pages 658 and 659.

HOW TO MAKE A CHEAP CAMERA CASE.

BY WALTER E. WOODBURY.

A FEW months ago I was badly in want of a case of some kind to hold my camera and slides when travelling, or when out photographing. On searching the various trade catalogues, I was much surprised at the high price charged for them; and so, after a little deliberation, I decided to attempt the construction of one myself. Having met with great success, I willingly give the particulars to readers of WORK who may be placed in the same position. The case I have succeeded in making is wonderfully strong and durable, has a very good appearance, is remarkably light, and the cost is but a fraction of that charged by dealers.

We will first of all, then, suppose we have a camera and slides, and all the other necessary paraphernalia used by the amateur photographer when out photographing. This will include camera, slides, lens or lenses, diaphragms, and focussing cloth. The stand, or tripod, should be carried separately or in another case. The first operation, then, is to arrange the required articles on a table in the most convenient and compact form possible, and this done, to take the outside measurements and obtain the necessary



Flat Pattern of Cheap Camera Case.

length, breadth, and depth of the case to be made.

We next procure a stout sheet of millboard, free from dents or cracks. The size of the board required is, of course, according to the size of the case. The length of the board should be rather more than twice the depth of the case and three times the breadth added together, and the breadth of the board should slightly exceed the length of the case added to twice its breadth.

The accompanying diagram shows how the board is to be outlined and cut out. With a knowledge of the required breadth, length, and depth, it will not be difficult to mark this out in pencil, taking great care that all the measurements are exact and the right angles true. The two inner flaps, A, A, can be made any size and shape, to suit the fancy. The overlapping sides, B, B, B, of the lid should be about two inches. In making large-sized cases, when a millboard sufficiently large cannot be obtained, the lid can be made separately, and fixed on as afterwards described.

The diagram having been carefully drawn out, and every measurement ascertained to be correct, the shape is cut completely through the board where marked by the continuous lines, and then half-way only through the thickness of the board along the dotted lines marked in the diagram. These half-way cuts should be made carefully, endeavouring, as far as possible, to cut through the same distance all along; if parts be cut deep and others only slightly, the bend is uneven and unsightly.

Having made the necessary cut, the next operation is to bend the board along the dotted lines, and thus form the case and lid.

Next procure some long strips of calico or linen (broad tape will answer the purpose very well), and glue them along all the joints. It is advisable to get someone to hold the two sides together while you glue the strips along: by this means a tighter and neater joint is made. If additional strength is required, strips of the calico can be glued along the joints on the inside as well. The edges of the box and its lid should also have some of the cloth glued along them.

We have now our camera case in the rough. It can, of course, be used as it is, but its appearance is decidedly improved by a suitable covering. This will depend, of course, upon the fancy and pocket of the amateur case-maker. A good waterproof material is, perhaps, the most suitable. Bookbinders' cloth, leatherette, or thin leather can also be used. Imitation Russian leather will, of course, serve to give a handsome appearance to the article, and even this may be surpassed by using the real thing.

For a first attempt, however, I should not advise this extravagance, as a good waterproof cloth will be found to answer the purpose very well. A little care must be taken in covering the case with the material: all the joints and edges should be made to come in the least conspicuous parts.

It has already been stated that the lid can, if preferred, be made separate. This is often an advantage, as the constant opening and shutting will soon break through the millboard, and then the lid relies entirely for its support upon the material used for the outer covering. If the lid is made separate, and before covering the case be joined to the binding with a strip of thin leather, glued tightly half on to the lid and half to the back of the box, a much firmer job is made.

In order to prevent the inside of the case from scratching the polish of the camera, it is a very good plan to line it with a suitable lining. Green baize is very convenient for this purpose, as it is very soft and inexpensive. The lining can be glued on after the case is formed, or the baize can be glued to the back of the millboard before the shape is cut out. A suitable lining certainly gives a more finished appearance to the article, and will prevent damage to the camera and appliances.

If the case be of large dimensions, and is inclined to have an infirm appearance, it can be made much firmer and stronger by fixing in a wooden bottom. This should be done before lining by cutting a piece of board about a quarter of an inch thick to the requisite size, and gluing to the bottom of the case inside.

A few drugget tacks or ornamental coffin nails, driven into the bottom of the case outside, gives a finished appearance underneath, and also protects the material with which it is covered when the box is rested on the earth or other rough place.

The only thing we require now for our case is a handle whereby we can carry it, and a strap to fasten it. If required, a suitable lock can of course be purchased from any leather case manufacturers, and fitted on to it. The cheapest plan, however, is to purchase a cheap luggage or cloak strap. The handle of this is sewn or wired firmly to the centre of the lid of the case, and the two straps

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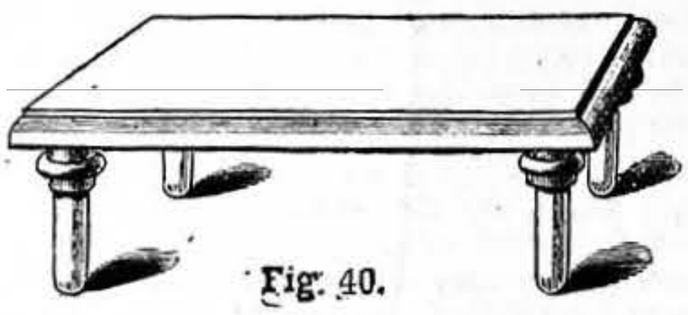


Fig. 40.

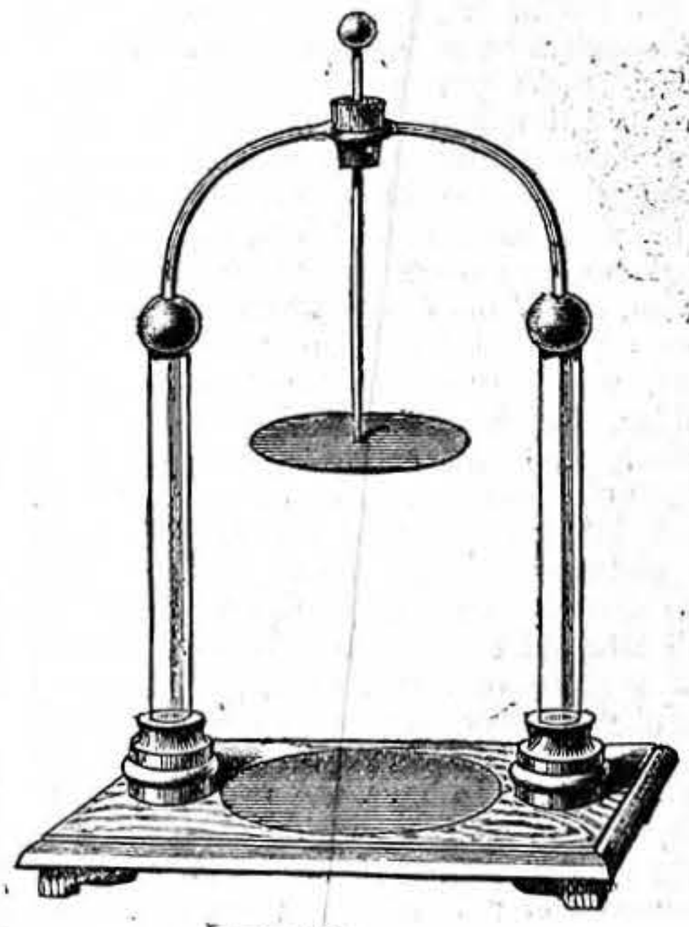


Fig. 39.

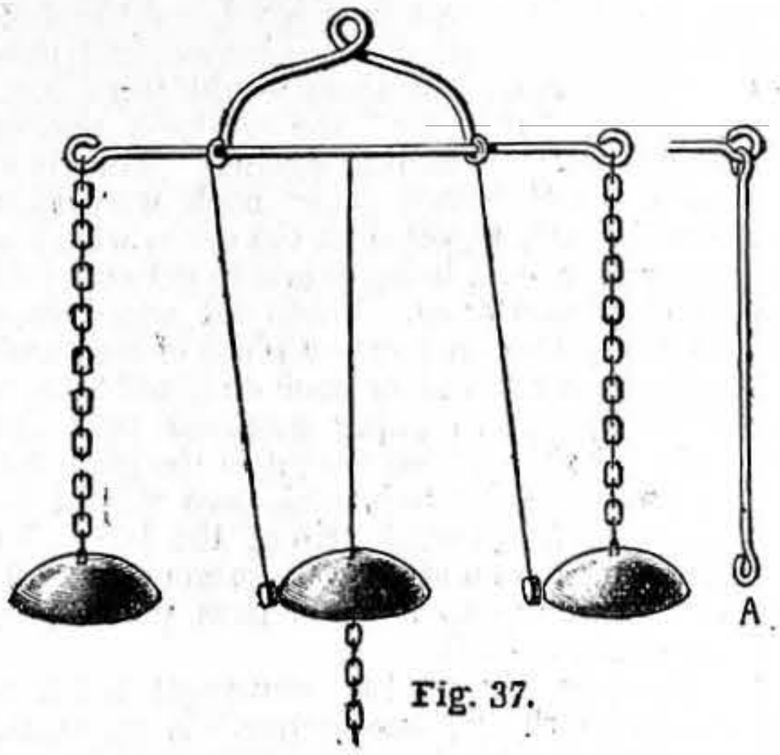
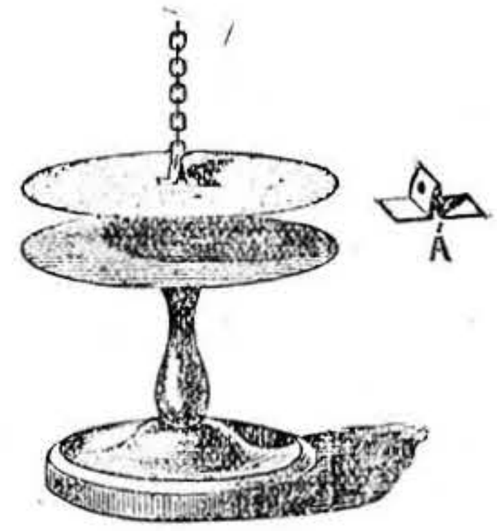


Fig. 37.



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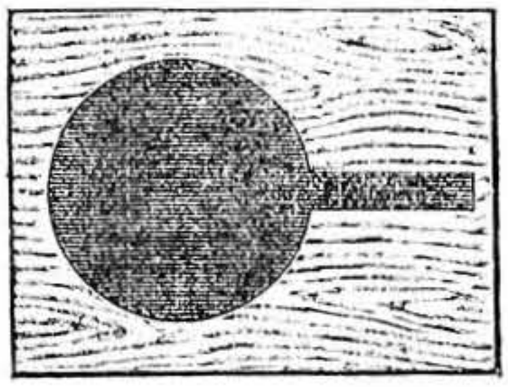

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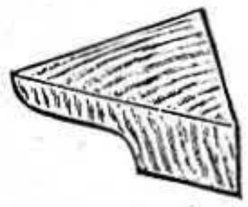

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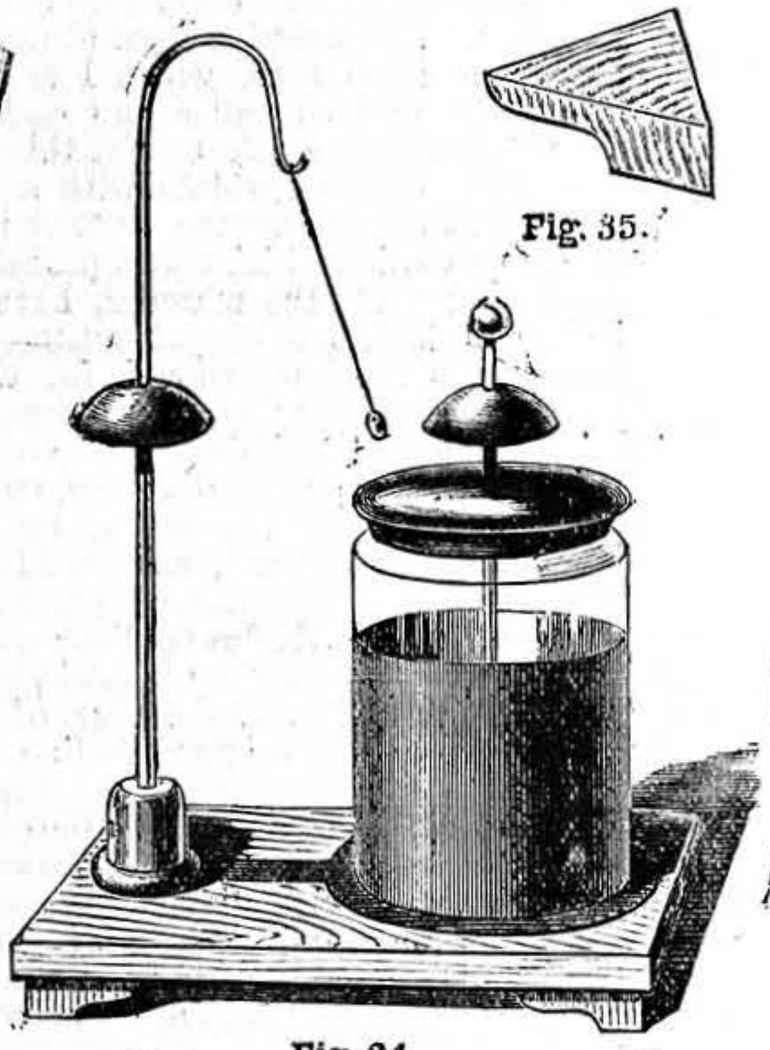

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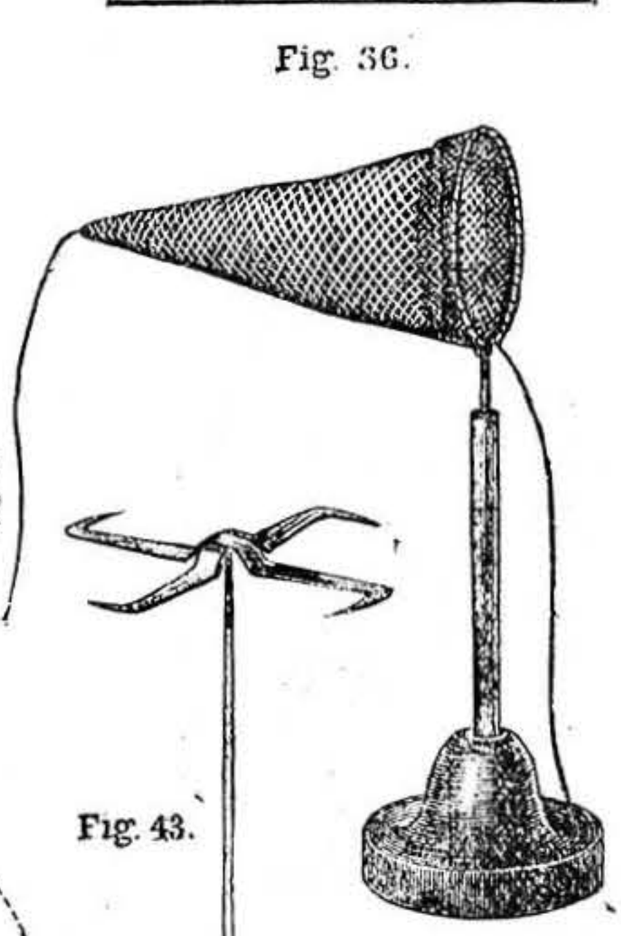

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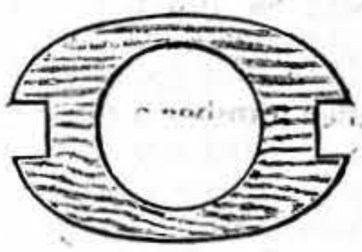

Fig. 49.

Fig. 47.

Fig. 48.

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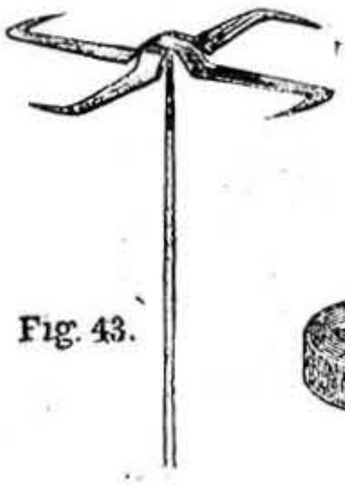

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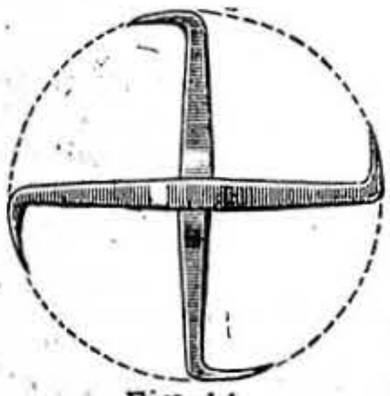

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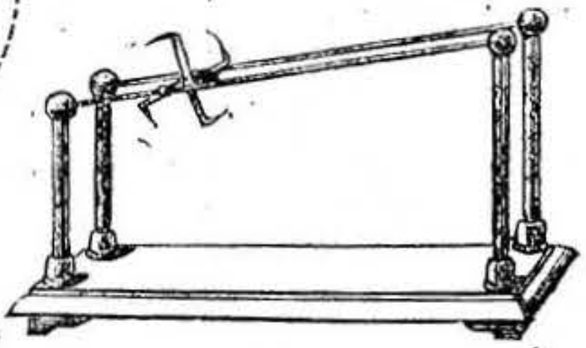

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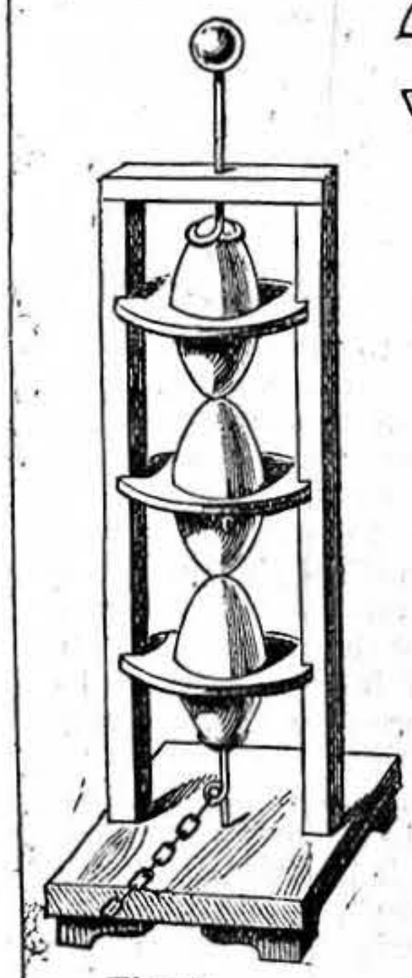

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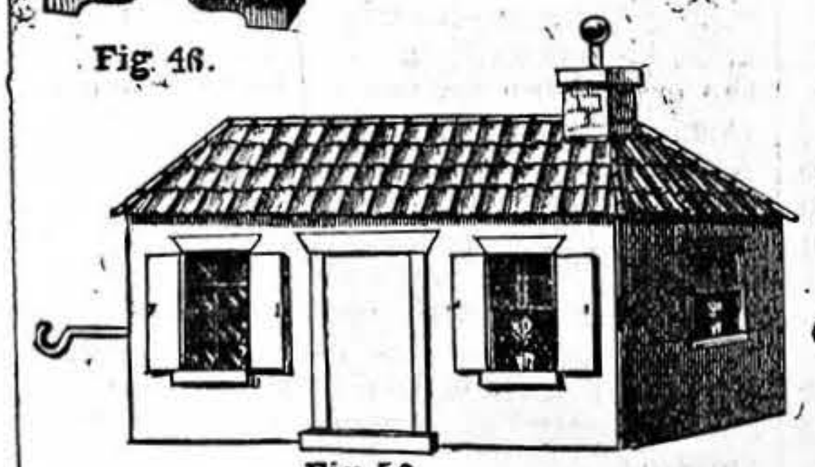

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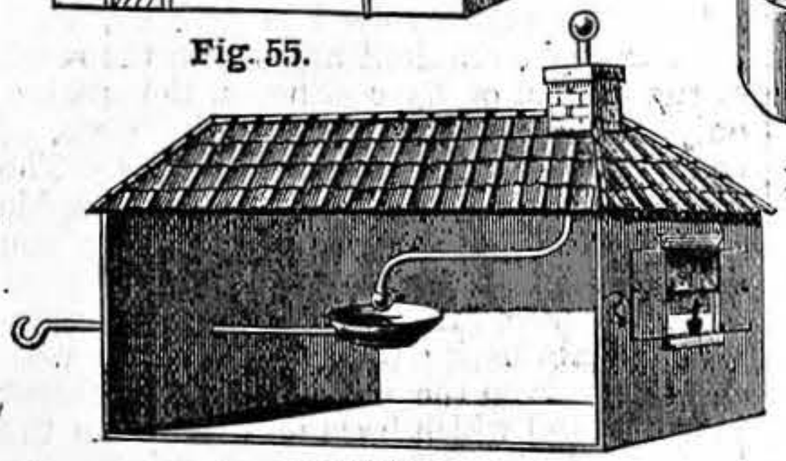

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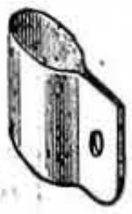

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Fig. 52.

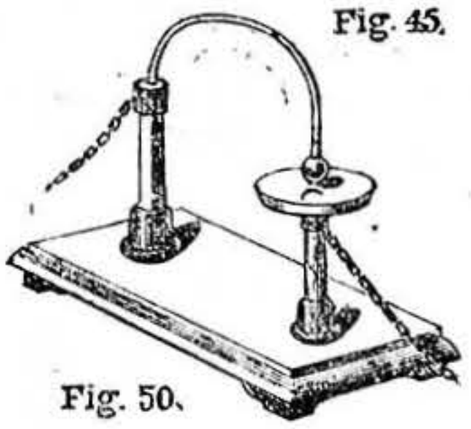

Fig. 50.

Fig. 34.—Leyden Jar with Bells. Fig. 35.—Moulded Supporting Foot. Fig. 36.—Plan of Base. Fig. 37.—Electrical Chimes—A, Alternative Support for Bells. Fig. 38.—Image Plate. Fig. 39.—Stand for Dancing Figures. Fig. 40.—Insulating Stool. Fig. 41.—Electrified Head of Hair. Fig. 42.—Butterfly Net. Fig. 43.—Whirl. Fig. 44.—Plan of Whirl. Fig. 45.—Electrical Inclined Plane. Fig. 46.—Egg Stand. Figs. 47 and 48.—Enlarged Details of Conducting Wires. Fig. 49.—Plan of Wooden Disc. Fig. 50.—Apparatus for firing Ether. Fig. 51.—Cap for Saucer. Fig. 52.—Cap for Bent Arm. Figs. 53 and 54.—Exterior and Interior of Fire House. Fig. 55.—Thunder House.

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pass round the case, fastening it tightly, and keeping the lid firmly closed.

Other improvements will, of course, suggest themselves. I have only endeavoured to give an idea how the thing can be done, and done with a suitable regard to cost. If the amateur likes to cover the case with real Russian leather, line it with plush or satin, and ornament the corners with silver plates, nothing I have said will prevent him. These hints as to the finish of the camera case, and the material and style with which and in which it may be finished, are merely thrown out to prevent any would-be maker of the appliance from thinking that there is any need for following a certain course with regard to the completion of the case, on the plea that such has been prescribed by the original maker, and that it is absolutely necessary on this account to follow it. On the contrary, it is better in this and all similar matters of finish and decoration for the maker to follow his own style, and to use such covering matter as may appear to him to be most suitable for the purpose, for by doing this, not only are different tastes better suited, but the pocket is also saved from needless depletion, which is of equal importance.

"PASSE-PARTOUTS," AND OTHER DECORATIVE MATTERS.

BY PASQUIN.

A LARGE number of the readers of WORK are such as might be included in the same category as the writer—those whose artistic instincts are ahead of their means. To such, therefore, all "tips" or "wrinkles" which may conduce to the embellishment of the home are always welcome; and it is with a view to supplement whatever has already appeared in the pages of our favourite journal that the present suggestions are offered for the consideration of the readers of WORK; and as all such "tips" are the result of actual practice and experience, it is more than probable that there are many who will appreciate them.

First, then, let us consider the old-fashioned "passe-partout," which furnishes us with a cheap and easy method of preserving such pictures as are not thought worthy of the expense of a frame.

It is surprising what good results may be obtained from the most unpromising materials. As an instance, I will mention a common woodcut, representing Defregger's "Holy Family"—a modern work, but one of considerable merit. This woodcut occupied the centre of a sheet almanac issued as a Christmas supplement with a certain weekly newspaper some three or four years ago. It was not worthy of a frame, so I proceeded to treat it as follows:—Firstly, I "painted" or "tinted" it in water colours, keeping the tones subdued, and in keeping with the subject. Then I procured a piece of ordinary picture-glass, half an inch larger each way than the actual size of the print, on which I had already left a margin of about an inch, thus leaving 1½ in. from the edge of the glass to the edge of the picture. This glass cost me only 3d. Then I cut a piece of stout *glazed* brown paper to the exact size of the glass: this was to form the *back*. I had previously prepared several yards of paper tape, about three-quarters of an inch in width, and coated on one side with strong gum, which was allowed to dry thoroughly. Dextrine would, perhaps, have been preferable, but the gum was at hand, and the dextrine was not. Glue would have done, if thin and workable; but there would have been a risk of "messing" the work—a matter always worth guarding against. The glass, picture, and brown paper back were then bound neatly together at the edges with the paper tape, care being taken to get an equal grip *back* and *front*. When all was dry—a matter of half an hour—a piece of macramè string was knotted at each end, and a band of strong brown paper gummed over the ends. As the whole weight of the glass has to be borne by this cord, care should be taken to get a sound grip of the latter, for which purpose a strip was gummed *lengthwise* from top to bottom, thus putting all the strain upon it.

Now, as far as the structural arrangements go, the "passe-partout" is complete, so we proceed to the decorative or ornamental part. I procured a sheet of the coarsest sand- or glass-paper, which I cut up into strips of an inch and a half each, taking care to have *clean edges*. For this reason, I pencilled out the widths with a straight-edge, and used scissors to cut with in preference to a knife, which would probably, from the nature of the material, have caused more or less of a ragged outline. As the sheet was not long enough for the sides, each was composed of two pieces, the join being afterwards hidden, as you will see later on. The angles, of course, required to be mitred, which I managed by squaring a piece of cardboard, and cutting across diagonally. This then served as a template, other or more orthodox appliances not being at hand. The strips of sand-paper were then *glued* in place on the edges of the glass, thus covering the original binding paper or tape, as well as the margin of the picture, which had been left for the purpose. The mitres, as well as the joins in the sides, were then covered with diamond-shaped pieces of the same sand-paper, while over these again were glued smaller, but shield-shaped, pieces. When all was dry, the strips were painted over with lithographer's *gold* bronze, mixed to the consistency of cream with gum-water. A little care is here necessary to keep the gold clear of the glass. The diamond-shaped pieces were then bronzed, but with *copper* bronze, while the small shields were finally touched up with *silver*, and the job was complete.

These "passe-partouts" have now been hanging up for three years, and begin to show signs of requiring a second wash of bronze; otherwise, they are as sound and elegant as the day they were made.

For bedrooms, nurseries, and other such rooms, this method will be found very useful, as the work involved is nothing, while the materials required are within the reach of the poorest of us, costing, at the outside, only about 3d. per picture—the glass, of course, being the principal outlay. The bronzes are very cheap, and any lithographic printer will, for a few pence, supply you with sufficient of each to do many pictures.

But we have hitherto dealt with a picture with a plain back; what shall we do with those cut from the pages of the illustrated journals, and which have letterpress on the backs? Unpromising as such prints may appear to be, it is possible, with a little ingenuity, to convert them into "things of beauty," and thus "joys for ever." As an illustration of my method of treating such woodcuts, I may mention a portrait of Mary Queen of Scots, which appeared in the *Graphic* some time ago. This was a copy of an ancient painting, and as I could not command even a replica of the latter, I conceived the design of making one for myself. I ought to add that the woodcut had letterpress all over the back. I got a piece of glass the exact size of the print, which I first *cleaned* perfectly. This glass must be *chemically* clean, or the picture will probably blister or peel off long after you have expended time and labour upon it. Having cleaned it perfectly, then coat it thickly on one side with freshly-made boiled starch, which should be of the consistency of blanc-mange. Soak your print for a few seconds in clean water, and apply *face* to the glass. Then take a piece of parchment-paper, thoroughly soaked in water, and apply to the back of the print. Then, with a paper-knife or other smooth-edged tool, commence to work out, *from the centre* and towards the edges, *all* the starch. Go over this several times, watching—from the front—for air-bubbles, which must all be squeezed out carefully and perfectly. Then, when no more such bubbles are visible, and no more starch is to be worked out from between the picture and the glass, set the whole aside to dry. This may take a day or so: don't attempt to hurry it. When quite dry, take a piece of No. 2 glass-paper, and go carefully all over the back, taking care not to make holes, or to rub hard. It is a positive advantage to have the printing on the back, as by this you can judge of the effect of the glass-papering process. When all the letterpress is rubbed down, go more carefully, but continue the rubbing down as long as you dare. When you judge you have gone down thin enough, take a piece of No. 0, and finish *very* carefully. With the finer number a great deal more of the paper may be got away—the object being, of course, to leave only the thinnest film, with the print on the front of it. As soon as the paper is rubbed away as far as is admissible, mix a little castor-oil and turpentine, in equal parts, and rub this mixture well into the remaining film with the tips of the fingers. Do not fear to use too much, as it can be removed afterwards, when its work is done. The effect of this dressing is to render the print transparent, which it does instantaneously. Leave the print thus "in oil" all night, and next morning remove all superfluous mixture with a piece of cotton-wool. In this process use all necessary care to avoid injuring the transparent film, which, however, will bear a great deal of rough treatment on occasion. Your picture is now ready for painting—the final process.

"Oh!" some readers of WORK will say, "this is only the old crystoleum process, with which everyone is familiar, and which is long out of fashion." I beg pardon of such gentlemen—for whom, by the way, this article is not written. Did you ever know the crystoleum process applied to common woodcuts, with printing on the back? Again, *two* glasses are used in crystoleum, while I only advocate one, the picture supplying all the necessary detail, and the "painting"—for want of a better name—being of the most slap-dash order. Nevertheless, the result is not only pleasing, but really artistic, having all the softness and "velvety" appearance of a crystoleum painting.

Now as to the "painting." Mix first a good flesh tint, which may be arrived at by using zinc-white, chrome-yellow, and carmine in due proportions. Experiment with these until you get a flesh tint suitable for the subject in hand. Then with a very fine pencil put in the lips (carmine), the iris of the eyes (blue or brown, as the case may be),

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the whites of the eyes, and all other fine or minute detail. Then with your flesh tint go *over all*, and afterwards put in your other tints or colours. As to the kind of colours to use, let them be *good* tube oils, but in the mixing use only turpentine—no *oil*—as you want your colours to dry quickly, while the glass furnishes more than sufficient glaze.

Pictures treated thus require no varnishing, a piece of soft paper being pressed over the back when the colours are finally dry, and the whole framed in the ordinary way. I have a series of four pictures thus produced, which were originally fac-similes of stained glass windows in the new Cardiff Castle. They are scenes from *As You Like It*, and were published as a supplement to the *Builder*. From this it may be seen that high-class productions are by no means essential.

Neither are woodcuts and prints the only materials available for the decoration of the impecunious man's home. The common plaster busts and images of the noble Italian refugee also lend themselves readily to artistic treatment—even the most crude and inchoate. What I once regarded as positive eyesores have, by judicious handling, become also "things of beauty," and—what is a still better test—money far in excess of their intrinsic value has been bidden for them. Take the well-known allegorical figures of Africa, Asia, etc., which I regard as most suitable for such manipulation. These are about 18 in. in height, and are sold at cheap rates by all statuaries. Go carefully over each one with a penknife and a fret-file or two, and remove all the "burr" left by the moulds. Of such excrescences there are usually more than enough to keep you employed for an evening or two. If the space between the upper and fore-arm and the head (as in the case of the "Basket of Flowers Boy") is left solid, bore this in the centre, and file carefully away to the proper outline, finishing, when necessary, with fine glass-paper. When all such false outlines are remedied, size the image with good strong size; thin glue answers very well. At this stage there is nothing very beautiful about the figure, which presents a uniformly streaky and dirty appearance. This, however, is of no consequence. Then mix your flesh tints, remembering that for "Africa" a different complexion is required to that which would be all right for "Europe." Experiment with white, browns, and yellows till you get it right. Then, when the flesh tints are put on, proceed to colour the garments, symbolical accessories, foliage (if any), etc.; but remember that each figure should be coloured "in keeping" with its subject. Any jewellery may be livened up with a little gold bronze, *applied dry* with a camel-hair pencil while the paint is still "tacky." In mixing the colours for this purpose, also, oil may be dispensed with for the most part, but carmine *always* requires a *little*, otherwise it dries *powdery*, and is liable to rub off if touched or dusted. No glaze is desirable upon statuary so treated; a dead surface is always preferable. Use the best artists' colours you can afford, and the result will agreeably surprise you. Some statuettes painted by the writer some five or six years ago are now as good as ever, and are still much admired.

These three methods of home decoration are, among others, drawn from the personal practice of the writer, and, besides furnishing his home with pleasing and durable ornaments, provided him with wholesome and fascinating employment during many a period of enforced idleness. Time of this kind, when employment even in the most trivial pursuits is welcomed as a boon, often falls to the lot of men and women, and hence the *raison d'être* of the instructions given above for the performance of work which people who are always busy might regard as useless and uninteresting.

Front and Side Elevations of a Useful Bookcase for Small Books.

A USEFUL HANGING BOOKCASE FOR SMALL BOOKS.

DESIGNED BY S. J. SPELLER.

It will be in the remembrance of many readers of Work that in the course of the year 1890 prizes were offered for competition by Messrs. Cassell & Company, Limited, for three designs for bookcases specially adapted to hold the numerous volumes of Cassell's National Library. One of the competitors, Mr. S. J. Speller, of Frome, sent an alternative design of a more simple character than that from the same maker which won a prize. It was intended to publish this, as well as the prize-winning design, at the time, but the demands on space in Work were then so heavy, that it was determined to hold it over for some future occasion. An opportunity of presenting it to our readers until the present time has not hitherto offered itself, and it is now given, partly on the principle that it is better to do a thing late than to leave it undone altogether, and partly because a simple but, at the same time, a highly attractive design of this kind is sure to find favour with many, and be made by them either for the adornment of their own homes, or as a welcome gift to add to the embellishments of the home of a friend.

The bookcase may be made in any material, from soft pine to hard oak, according to the preference of the maker; but if it be intended to enrich the work with carving as shown in the design, hard wood should be used. Moreover, pine is by no means a wood suitable for carving, and the workman might come to grief in endeavouring to copy the ornamentation at top and bottom in any soft material. Therefore, all points considered, it may be taken that oak is by far the best timber to use in making a set of hanging bookshelves, such as those now under consideration. The total height of the bookcase from top to bottom is, as shown in the illustration, 4 ft. 3 in., and dividing out and marking this as a scale, the proportions of other parts can be easily ascertained by actual measurement. It may be said with reference to sizes of parts that, in order to give due effect to the carved work on the front edges of the sides, the sides themselves should not be less than 1¼ in. in thickness, or thereabouts; the depth of the panels, as shown in the side elevation to the right, from ¼ in. to ⅜ in. below the original surface; and the shelves about ⅝ in. thick. The ornamental work at the top and bottom may be pierced as shown in the front elevation to the left, or boldly carved out of the solid and the ground stamped. The sides may be got out of 1 in. stuff if preferred, but if the edges are carved according to the design, they will not present as effective an appearance as they will when worked in thicker stuff. The sides should be further rebated to take back, and grooved on the inner surface of each to take the shelves.

It has been said that the bookshelves are intended for the reception of very small volumes—namely, those of Cassell's National Library, a new issue of which, with various additions, is now in progress. There is no reason, however, why bookshelves on this pattern should not be made to take larger volumes; and, if this be desired, all that has to be done is to make the sides of suitable length, and to make the width of the space between shelf and shelf proportionate to the height of the books each shelf is intended to hold. The edges of the shelves may be simply carved, the leather, as shown in the illustration, being inserted in a groove made in the under part of the shelf a short distance from the edge, and held in place by a slip of wood which fills the remainder of the groove. Those who cannot accomplish the grooving may attain the appearance by pulling the leather along the edge of the shelf—by gluing is the best mode—and then putting on a bead of the same thickness as the shelf outside the leather.

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A COMFORTABLE ARM-CHAIR.

BY H. A. MILES.

INTRODUCTORY REMARKS—MATERIAL AND UPHOLSTERY—ECONOMICAL USE OF MATERIAL—FRAMING—THICKNESSING—CHOICE OF MATERIALS DETERMINES METHOD OF CONSTRUCTION—HOW TO CUT OUT PIECES OF FRAMING—CONCLUDING REMARKS.

Introductory Remarks.—Every house is usually furnished with an arm-chair, or so-called easy chair, but how seldom is it a seat into which a tired person could sink and drop off to sleep! As a rule, the seat is so deep that, unless the owner is possessed of exceptionally long understandings, he would be unable to recline against the back without raising his feet from the floor; then how frequently the back is either too upright or too sloping, too high or too low, either propping the head up in the comfortable manner of a photographer's rest, or suffering it to hang over in a manner strongly suggestive of a barber's shop.

To obtain the maximum of comfort, of course, a chair should be made of a size suitable for the person who will occupy it; but a happy medium may be struck, and a chair produced of such a design that most persons would be able to indulge in a post-prandial forty winks in ease and comfort.

Such a chair it was my good fortune to come across during my recent wanderings in the country, and as I never lose an opportunity of making hay while the sun shines, I at once pulled out my rule and made a rough dimensioned sketch of the chair on the spot, taking the opportunity afforded by the first showery afternoon to try and introduce it to my readers.

Material and Upholstery.—The material used was English oak, upholstered in morocco.

A side elevation is shown in Fig. 1, a back view in Fig. 2, while Fig. 3 shows the most economical method of cutting out the material.

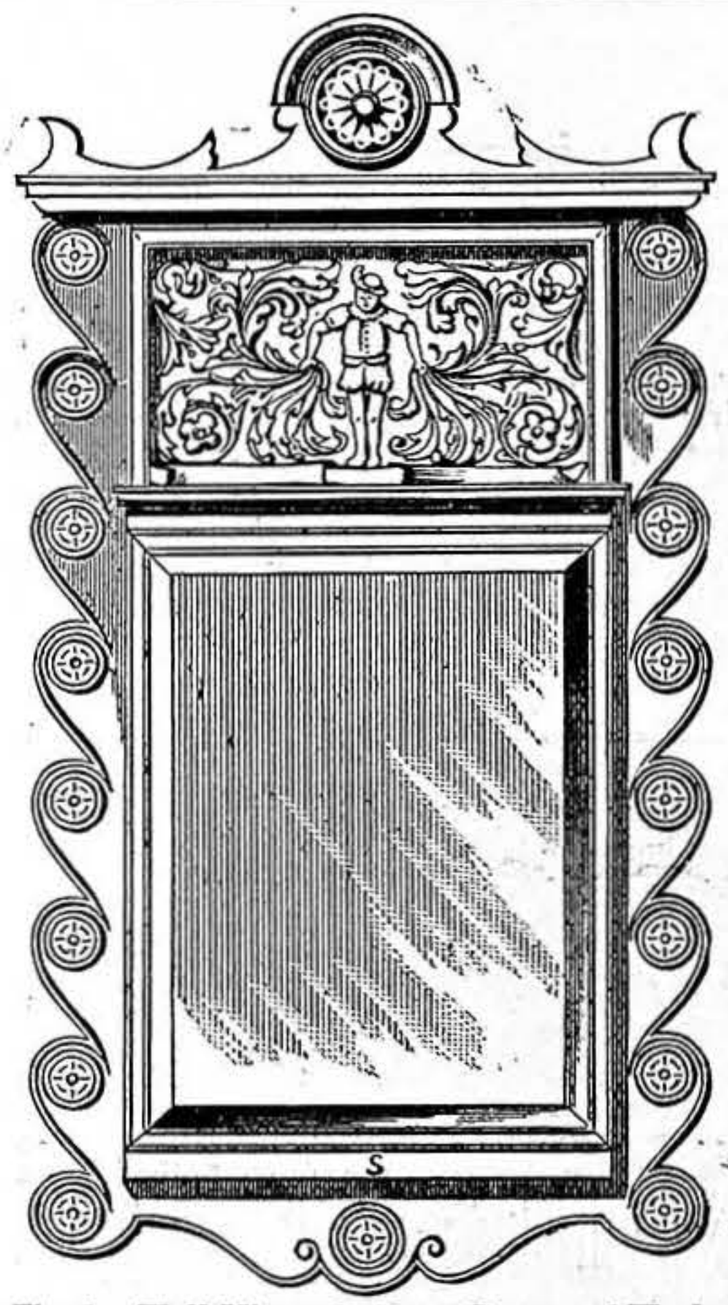

Fig. 1.—Wall Mirror in Brass Repoussé Work.

Framing.—The thickness of the framing is about 1⅜ in., and the portions round the seat and back are thicknessed up with ¾ in. deal on which to fasten the upholstery.

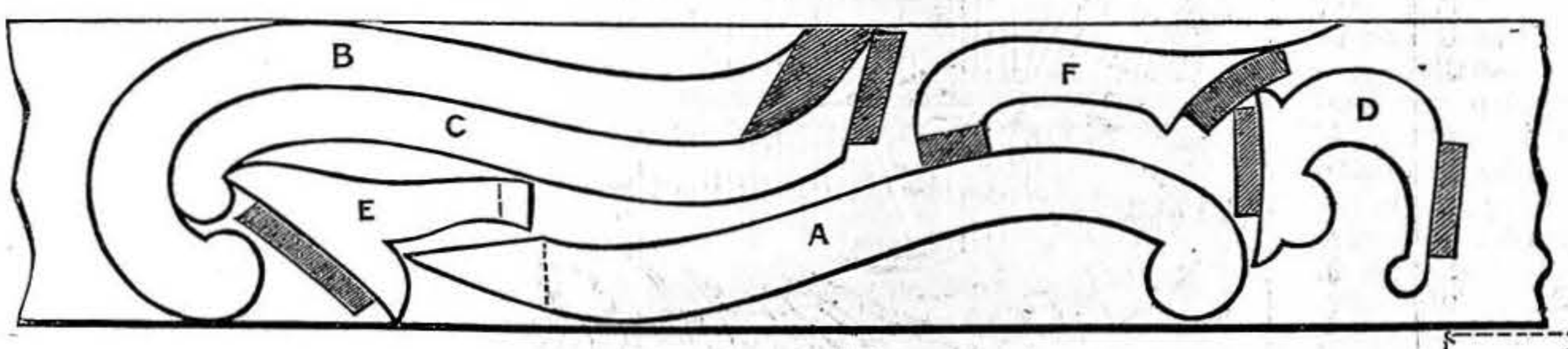

Fig. 3.—Method of cutting out the Various Parts from one Piece of Board.

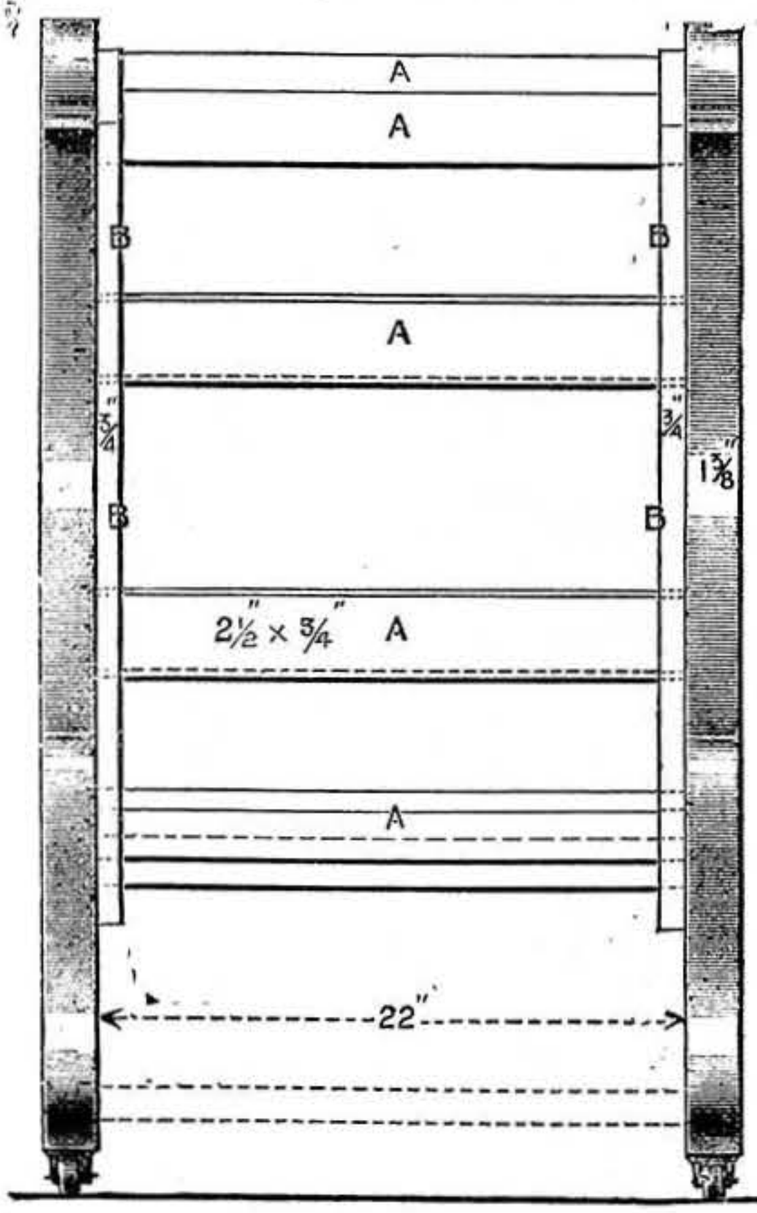

Fig. 2.—Elevation of Back of Chair.

It would be preferable to mortise and tenon the cross pieces, A (Fig. 3), into the side pieces, B (Fig. 3), before gluing and screwing the latter to the side framing, as the tenons can then be wedged up.

Choice of Material determines Method of Construction.—If oak is considered too expensive, good yellow deal or pitch-pine would make a very neat-looking piece of furniture. If pitch-pine or any other soft wood be used, it would be advisable to add a rail between the front legs, as shown in Figs. 1 and 2 by dotted lines, G.

How to cut out Pieces of Framing.—The entire set of pieces are in duplicate, so that if two pieces of wood be fastened together and the curves drawn on one side, all can be cut out together, either by a frame-saw, used by hand, or preferably by means of a band-saw.

Concluding Remarks.—I have merely given a rough idea of the chair, without entering into small details of construction, and for this reason have given dimensions from centre to centre, so that the proportions of the parts may be modified to suit the strength of the material used without materially altering the design.

I can safely promise anyone who has the necessary ability to make it that he will have to take a long journey if he wishes to find a more comfortable seat.

A WALL MIRROR, WITH BRASS ORNAMENTS IN REPOUSSÉ WORK.

BY ROBERT COXON.

THIS design for a wall mirror will be found to produce an effective piece of work if carefully carried out. It is designed more especially to suit the brass frieze, which is of an original character in a quaint old

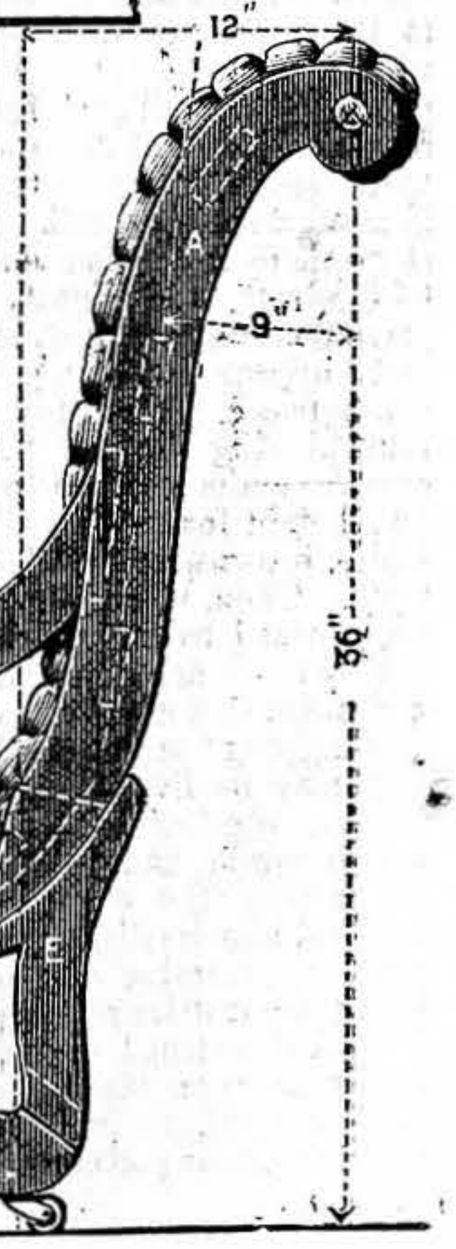

Fig. 1.—Elevation of Side of Chair.

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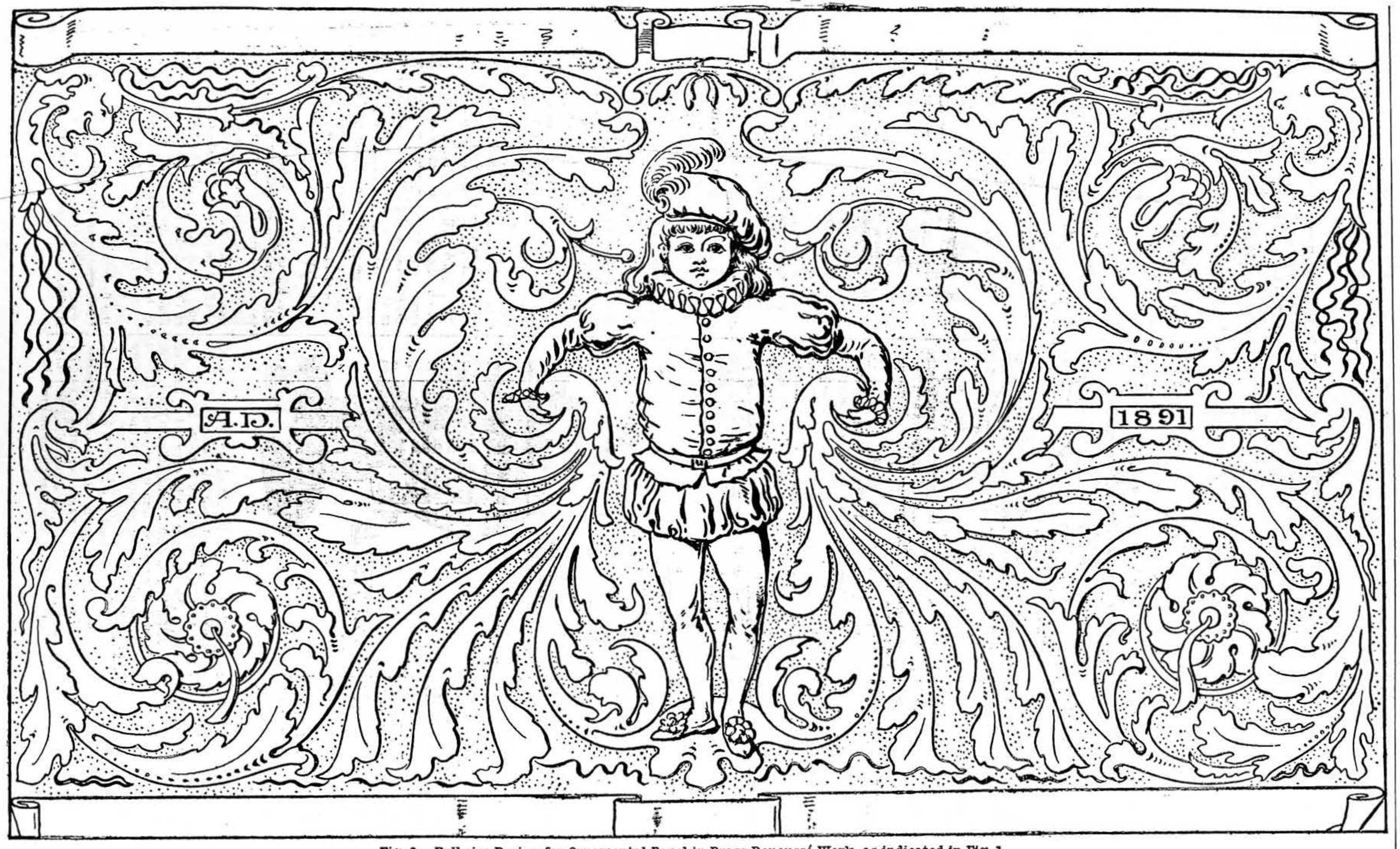

Fig. 2.—Full-size Design for Ornamental Panel in Brass Repoussé Work, as indicated in Fig. 1.

English style, and would form a charming piece of decoration for amateur repoussé workers; the woodwork best suited being ebony or a hard wood stained or ebonised, but the characteristic of the drawing would lend itself to reproduction by wood-carver's tools, and those of artistic tendencies would find it a good subject for execution in painting or gesso work. Those of our readers requiring a more simple method would find little difficulty in reproducing the design in burnt wood engraving, a simple but effective art which is much followed just now.

If carried out in brass repoussé work, care should be taken to carefully trace the design, as much of the crisp effect is lost when this is not uniformly correct. The rosettes at the frame scroll work could be purchased at a moderate cost from any upholsterer's furnisher, and might be equally effective a little smaller than shown, but not to exceed 1½ in. in diameter. The bevelled glass is mounted in the frame with a ¾ in. moulding. The shelf s at bottom of the glass would be about 3 in. broad. This shelf, as will be seen by looking for it in Fig. 1 in the opposite page, is shown only by its edge, Fig. 1 being intended to show the mirror complete, and the position of the ornamental panel in brass repoussé work at the top (as shown full size above in Fig. 2), and the enrichments of the frame.

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SHORT LESSONS IN WOOD-WORKING FOR AMATEURS.

BY B. A. BAXTER.

SETTING OUT.

WE have looked at the setting out for mortise and tenon and for dovetail joints. There is a further hint to be given on dovetails—that is, to avoid too great an angle in the spreading of the dovetail. The common idea is that the greater the difference between the size of the pins at the outer surface, where they are small, and the inner surface, where they are large, the better. Now it is not so. It only needs a slight difference, depending, of course, upon the thickness of the material what that difference is to be. Look at some good cabinet-work, and copy the angles and proportions of dovetails and pins.

Dowelled joints may be set out in similar manner—that is, with square and gauge; but if many joints are to be made, a template, which can be made of thin wood, metal, or even cardboard, will be of service in saving time, the centres of the dowels being pricked through the template, and, by its aid, to the work itself. Care must be taken in the use of the template that it is not turned, but used from the proper edge in every instance. It is to be remembered in setting out that every detail should be known and provided for at the beginning, otherwise mistakes will arise.

The professional way of setting out is by means of a rod, as it is called, which is a strip of wood as long as the work, on which all the lines are marked on one side, measured lengthways, and usually on the other side, or on a separate rod measured *across* the length. This answers the purpose as well as a full-size drawing to a workman; but by all means retain the habit of making scale drawings of your work, if you have such a desirable habit; if not, attain to it as soon as possible. The time when the workman shall be an *artificer* in its true sense will be brought nearer when the workman is in the habit of drawing to scale plans, elevations, and sections of his work. It will cultivate the ability to see the end from the beginning, which is needful if a working drawing is to be entitled to the name of a design.

The setting out *is* the difficulty of the beginner, but the difficulty disappears as he is learning to draw to scale. There is no plan of learning so good or so rapid and effective, and for the amateur, for whom these lessons are intended, it is absolutely necessary that he should learn to do whatever he wishes by himself, availing himself, of course, of any convenience of prepared material, but making the article suitable to its intended purpose, and to show its suitability obviously, yet pleasing the beholder by the oneness of the whole thing.

On the subject of setting out, I must remind the reader that he must, in most cases, be guided by the capacity of his tool-chest. It is of no use to gauge for a tenon of any other size than one we have a chisel suitable for, or to mark dovetailing smaller than any chisels we have in stock, or dowels of a size we have no bits to bore, and so on. On the other hand, halving, dovetail halving, housing, and bridle-joints are not so very imperative in demanding special tools, or tools of a special size. The best thing that the amateur workman can do when he finds that he wants a chisel or bit of a size he has not got, is to buy it. Tools are always useful, and, in this case as well as others, store is no sore.

OUR GUIDE TO GOOD THINGS.

⁂ *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

99.—ROGERS' IMPROVED ATTACHMENT FOR LATHES.

SOME of my readers may, perhaps, remember that in Vol. II., page 583, of WORK, otherwise No. 88, an illustration and description were given by a correspondent of an improved shaping attachment for lathes. In the illustrations given below, a modified form of shaping attachment, similar, in some respects, to that to which attention has just been directed, is shown. This form, which is known as "Rogers' Improved Attachment for Lathes," has been designed by Mr. F. M. Rogers, Fellow of the Chemical Society and Associate of the Society of Telegraph Engineers and Electricians, to meet the demand for a tool of this class, capable of working on a slight, single-geared treadle lathe such as is generally used by amateurs and light metal-workers. The appliance itself, in its complete state, is shown in Fig. 1. The stroke is fixed, and is determined by the throw of the eccentric sheave shown in Fig. 2, which is screwed direct to the nose of the mandrel, and travels in the grooved path upon the back of the face-plate, thereby imparting a noiseless reciprocating motion to it. The attachment is made to suit lathes of different sizes, but the stroke in the size shown in Fig. 1, which is the size adapted to a 4 in. centre lathe, is about 2 in., which enables one hundred and twenty cuts per minute to be taken with ease in brass or gun-metal. The V packing-strips are of gun-metal, and an adjustment is provided for taking up wear. When fitted with

Fig. 2.—Eccentric Sheave.

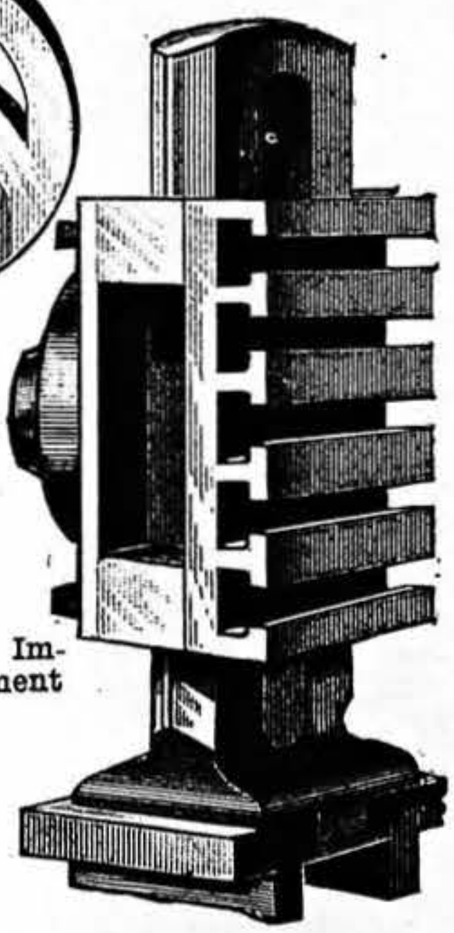

Fig. 1. — Rogers' Improved Attachment for Lathes.

a parallel vice, this little tool will rapidly shape odd pieces of metal which otherwise would have to be filed up. Larger work is bolted to the face-plate. The slide-rest can be operated by hand or by self-acting motion. In addition to the shaping of metal, planing can also be effected by the aid of this appliance, key-grooves cut, and a variety of other tooling work accomplished with accuracy and rapidity, provided the speed is suitably proportioned to the work. Light metal workers will find their work much facilitated by supplying themselves with a punch and pair of shearing-blades for cropping sheets or plates and roughing out material. These, it is almost needless to say, can be procured with the attachment, which, when in use, has its standard bolted to the bed of the lathe. This appliance is well worthy the attention of turners, especially amateurs who have an inclination for metal work. It appears to have been carefully designed with an especial view to the general requirements of this class of workmen, and to be turned out with equal care, accuracy, and finish.

100.—KERR'S IMPROVED WORKMAN'S DRINKING FLASK.

The ordinary oval tin bottle or flask generally used by workmen, stoppered by a cork, and unprovided with any means by which its contents may be swallowed other than by that of pouring

Kerr's Improved Workman's Drinking Flask with Cone Cover (A); with Cone Cover inverted and screwed on Flask (B); Cone Cover inverted (C) as Cup; Milled Stopper (D); Section of Top of Flask (E).

them into the mouth through the orifice at the top, must certainly give place to the neat and well-appointed drinking flask known as "Kerr's Improved Workman's Drinking Flask," invented and recently patented by Mr. D. W. Kerr, plumber to the Dumfries Gas Commission. This flask, when not in use, or when filled with tea or coffee, presents the appearance shown at A in the accompanying illustration. In this it looks like an ordinary round bottle with a cone-shaped top and a milled cap or cover, which screws on or off at pleasure, in place of the ordinary cork, with a handle affixed to the upper part by which the can may be slung or carried in the hand. A closer examination, however, reveals the fact that the cone-shaped cover screws off, and shows that underneath it is another top fixed to the bottom, also cone-shaped but handleless, as may be seen at B. In the top of this is inserted a short brass cylinder with a screw-thread cut within, as shown in section at E. The cone-shaped cup or cover, when removed, appears as shown at C; and when it is turned upside down in this position, the orifice that is now at the bottom being closed by the milled cap or cover—shown separately at D—can be used as a drinking cup. But it has yet another use than this, for when the milled cup is removed, the cover or cup can be screwed into the mouth of the flask and thus act as a funnel or filler when pouring in hot tea or coffee. When heating tea or any other liquid in an ordinary flask, it is necessary to remove the cork or top screw to allow the steam that is generated to escape, but with this improved flask a mere turn of the cover suffices to afford an outlet for the steam through a small hole in the screw part shown at E. The steam is directed downwards between the top of the flask and the cover, and cannot blow upwards so as to scald hands or face. The movable cup, moreover, speedily cools, and may be used for drinking purposes as soon as the liquid within the flask is hot enough. The flask is made in three sizes—namely, 1 pint, 1½ pints, and 1 quart—and will be found as useful at picnics and to sportsmen and tourists as to working men.

THE EDITOR.

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SHOP:

A Corner for Those who Want to Talk It.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

II.—Questions Answered by Editor and Staff.

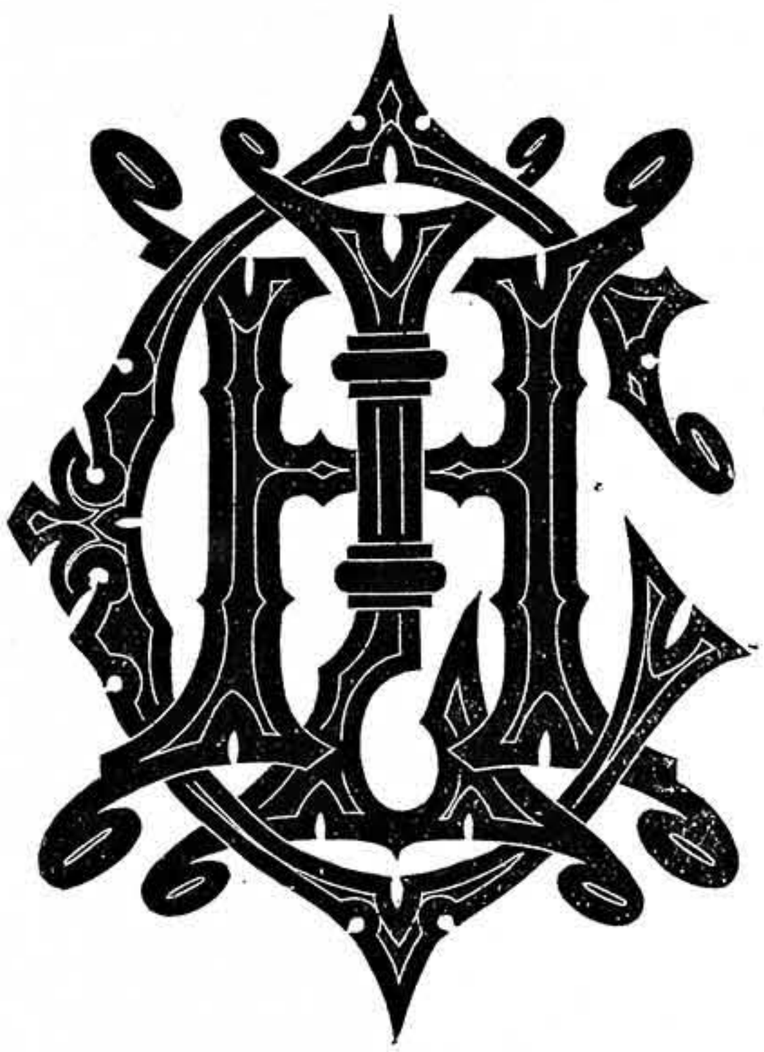
Subjects for Royal Engineers.—J. B. (*Salford*).—The Royal Military College, Sandhurst, is devoted to the instruction of young officers, both for cavalry and infantry, after they have passed the examination for commissions, and before they are appointed to regiments. The course lasts a year, and the instruction is confined to purely military subjects—fortification, military sketching, tactics, military law, correspondence, and accounts. At the conclusion of the course, the students are required to pass an examination in these subjects, and their commissions are dated according to the result; those in the first class being antedated two years; those in the second, twelve months; and those in the third dating from day of examination. You would have to enter as a candidate at an open competitive examination. The limits of age are seventeen to twenty, except in the case of university students and one or two other exceptions. The examinations are held under the Civil Service Commissioners. The successful candidates receive commissions as sub-lieutenants, and then go to Sandhurst. The Royal Military Academy at Woolwich is the training school for Royal Engineers. The course of instruction is mainly scientific, mathematics being one of the chief subjects—and also professional. Successful candidates for the Engineers receive appointments, and may go to Chatham, or be employed on works or buildings.—J.

Piano Tuning.—JACKSON.—A very concise and clear little book of instructions to pianoforte tuners is "The Tuner's Guide," by Abadie, price 6d., published by Lafleur, of Green Street, Leicester Square. We know of no work on the voicing of harmoniums and American organs; though we have an impression that Messrs. Metzler, of Great Marlborough Street, used to publish a little *brochure* on the subject.—G.

Harp.—CONSTANT READER.—It is scarcely possible, within the limits assigned to inquirers in this column, to give full working details of the construction of a harp. Here, however, are some of the main features, which will enable our correspondent to set to work. A harp consists of three parts: 1, a column; 2, a body, shaped like a boat and held in shape by ribs; 3, the neck. The wood usually employed is maple for the pole, body, and neck; and for the sounding-board or belly, a special kind of pine-wood—obtained principally from the forests of Bohemia and Switzerland—which possesses a high degree of sensitiveness to musical vibrations. The same description of wood has been and is still used for the sound-boards of every description of musical instrument—violins, 'cellos and string basses, guitars, zithers, and pianos. The only metal work employed is the ring in which the pole is held where it joins the body at the base or thick end, and the wrest-pins or tuning-pins. The distance between each two strings is determined merely by the thickness of the player's fingers. The pole is made separately, of course; the body separately, the neck separately. The neck is glued permanently into the head; but the body is not permanently fixed—it is held in position by the tension of the strings on dowels at the treble end, and by the ring already referred to at the base. Seven strings complete the octave, so that a 5-octave harp would consist of thirty-five strings; and our amateur harp-builder would probably add another string, so as to make the harp begin and end on the same note. Should he wish for a few extra semi-tones, to enable him to wander from the key in which he starts, he must procure some fiddle-pegs, and insert them in the neck in such a way that, when turned from the vertical to the horizontal, the peg shall, by pressure on the string, shorten it by about one-sixteenth of its length—*i.e.*, so that it will arrest the vibrations at a point about one-sixteenth short of its total length. The shortest string, E, on Erard's 43-string 6-octave harp is 3 in. long, and the longest, G, is 58 in. There is a double-action harp which gives three different sounds from each string; but, should our correspondent's ambition have contemplated the making of one of these, there is only one way to accomplish it—viz., to buy one, take it to pieces, see how it is made, and copy it.—G.

Pantograph.—JOINT.—The pantograph has had more than one allusion made to it in back numbers: see p. 669, Vol. I. (No. 42), for an illustration and a description of it. Do not concern yourself with making one. At a price not exceeding sixpence one may be bought, which would afford you every detail necessary, if you contemplate making quantities for sale; or would answer its destined purpose much better, probably, than a home-made one would. Any artists' colourman would obtain you one.—J. S.

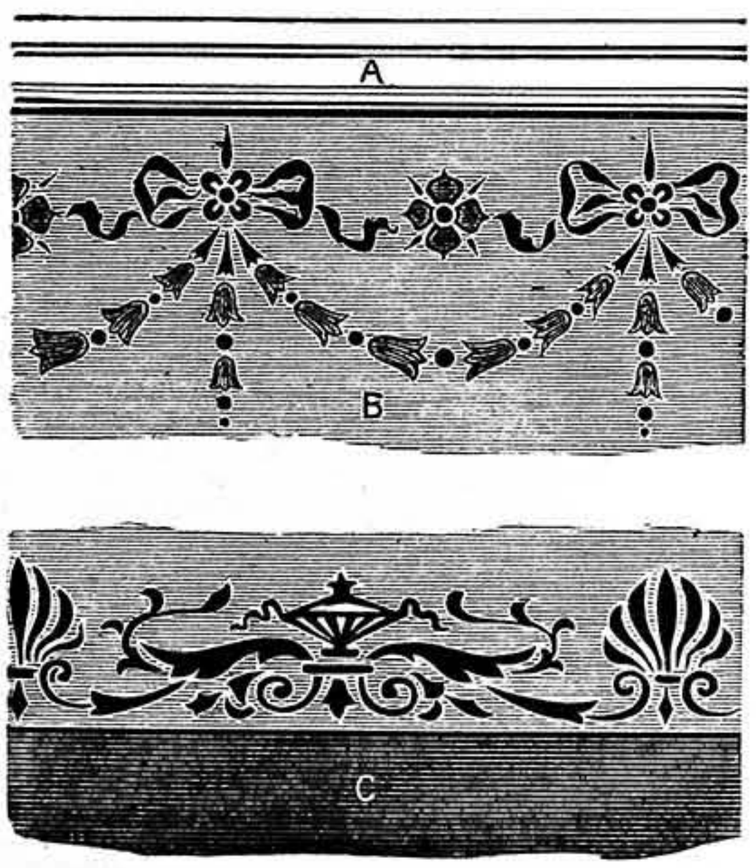
Monogram for Inlaying.—C. L. H. (*Reading*).—In print this monogram is decidedly bold, distinct, and effective; nevertheless, C. L. H. could render it much more so if—when reproducing for inlay—he composed each initial of a different-coloured wood; or, if a subdued and delicate effect be preferred, three *shades* of any particular colour could be employed—say, for instance, dark, medium, and light yellows. These would certainly make a rich and pleasing combination. Should our correspondent



C. L. H. Monogram for Inlaying.

possess sufficient patience and skill, he could even introduce two colours or shades in each letter, taking the white lines on the lettering as indicating the middle insertions. This treatment would, of course, necessitate great care; but, if neatly executed, the result would amply repay the time and trouble expended. Before piercing, C. L. H. would, doubtless, profit by noting the hints contained in previous replies to E. M. N. and others which have appeared in WORK.—A. C.

Paint, To Harmonise.—J. K. B. (*Manchester*).—For a bedroom treated in "light pink," I think your safest colour for a frieze stencil would be a dark shade of the wall colour. If you are going to put a dado of colour, then it would be well to make up this, using the same stainers as for the pink, but also adding umber, in order to keep the red under control. Then use the dado colour for the frieze. I must confess that I don't admire *both* dado and frieze in a bedroom; but if the room is of a good height, and the customer desires it, well and good.



A, Cornice; B, Frieze; C, Dado.

The frieze stencil and border I have sketched here to half scale would look well in one colour. I should also advise stencilling the dado border with the dado colour, and then running a base-line to the border in black, or very deep bronze-green. Sage, or very quiet yellow-green, is the only other tone likely to suit with your wall colour and for a bedroom. I think shades of all one warm tone will be best. Mind your stencil colour is strong enough. Dry a piece upon the pink before use.—DECORATOR.

Combined Bench and Tool Chest.—MANCUNIAM'S address is unknown to us. If you require more than the full details already given to you on p. 524, No. 33 of WORK, please write definitely through "Shop."

Bending Brass Tube.—A PUZZLED ONE.—I expect that what you call brass tube is in reality what is known in the trade as brass-cased tube—that is, an iron tube with a thin casing of brass. If this is the case, I advise you not to try to bend it to an angle, but to cut and mitre it. Bend a piece of solid round iron to the angle of the window; let it be about 3 in. long each way, and let this fit tightly into the cased tube and form a connecting piece. You can solder the mitre-joint or not; if you make a true and good fit, it is hardly necessary. I have fitted up a good many in this way with satisfaction.—R. A.

Soldering Hoops on Churns.—E. T. (*Broadway*).—It is decidedly best to take the hoops off, and re-tin the part that comes in contact with the churn. To get over the difficulty of keeping the hoop hot whilst you solder round, you should use a gas blowpipe to warm it as you go along. With regard to learning the churn-making trade, you ask if you would have to serve a time and pay a premium. If you know anything of tin-work in general, you could get a job without either paying a premium or serving a time; but it would be as an improver, and at a lower wage than you would get in any branch that you were familiar with.—R. A.

Battery for Lighting Model Church.—VEGA.—It may interest you to know that I have a small single fluid bichromate battery of four cells, contained in a case about 6 in. by 6 in. by 6 in., with lifting arrangement for immersing elements as required, which brilliantly lights a 2½ c.-p. incandescent lamp. If you would like a description, I will give it you, with the Editor's permission.—H. E.

Dulcimer.—W. M. C. (*London*).—All the information you require upon this subject will be found in the following numbers of WORK: 31, 38, 41.

Imitation Tortoiseshell.—R. G. H. (*Birmingham*).—The address of the Xylonite Company is Fore Street Avenue, London, E.C.; and besides being makers of imitation tortoiseshell, they also turn out some capital imitations of ivory, coral, lapis, etc., in xylonite. There is an article on xylonite on p. 787, Vol. II. of WORK (No. 101), in which the writer gives some useful information; but not on polishing. The firm will reply to you if a stamped directed envelope is sent; but meanwhile a good surface can be obtained if it is treated as tortoiseshell is—viz., smoothed with a file and glass-paper if necessary, then with fine powdered pumice and water, and finally with clean damp whiting, finishing up by rubbing with dry whiting and the palm of the hand. The pumice and damp whiting is applied by means of a piece of soft cloth, unless you have a lathe, when a dolly or bob might advantageously be used for it. If you look through the indexes of the two volumes of WORK, you will find several answers on polishing horn and tortoisesheli, which may help you. In this case where you say you want to re-polish some handles that have gone dull, fine whiting ought to be sufficient when added to a good lot of rubbing.—H. S. G.

Gold Lace.—L. N. (*Oldham*).—To clean this, refer to a reply on p. 223, Vol. II. of WORK (No. 66), which you can order through your newsagent for 1d. This is always an unsatisfactory job, and when you get your new regalia, take the greatest care of it by carefully drying it in a soft rag if by any means it gets wet. Keep it out of the way of smoke, etc., in a tight-fitting box, and do not let any rubber rings be used to fasten the box, or even kept near it, for silver tarnishes very quickly even when gilt, as it is in your case. Gold lace, so called, is, I believe, never of gold, but either silver or copper wire electro-gilt.—H. S. G.

Embossing on Glass.—A ZINC-WORKER.—You say that you "have tried fluoric acid for embossing on glass with little or no result, as it bites into the glass, but leaves a clear ground." Now, this is just how it should act, and diluting the acid would certainly not produce the ground glass appearance. Where you have made a mistake is in using fluoric acid instead of fluoric acid *gas*. To make this, mix finely powdered fluor-spar (calcium fluoride), three parts, and sulphuric acid, two parts: put in a leaden dish; lay the glass to be etched, with the design prepared and drawn in the same way as for the liquid process, over the dish, and apply a gentle heat; the gas is then given off, and the glass is etched with a ground appearance. This operation should be conducted in the open air, as the fumes are highly dangerous to health. If you do not care to use this method, the only other way is to proceed as you have been doing, and afterwards roughening the design with emery of different degrees of fineness; but you would find this rather a risky proceeding, and the results would not be as good.—W. E. D., JNR.

Sign-Writers' Alphabets.—W. R.W. (*Fulham*).—I cannot understand that you could not obtain what you desire from Brodie & Middleton. Nevertheless, you will find what you want in the following books, published by Crosby Lockwood and Co., Stationers' Hall Court, E.C.: "Ornamental Alphabets, Ancient and Mediæval," by F. Delamotte, cloth, price 4s.; or, "Examples of Modern

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Alphabets, Plain and Ornamental"; or, "Mediæval Alphabets and Initials for Illuminators." There are also several sheets of alphabets, etc., in "The Art and Craft of Sign-Writing," published by W. G. Sutherland, St. Ann Street, Manchester.—H. L. B.

Incubator.—W. E. T. (*Burton-on-Trent*).—Probably before you see this the wished-for article on a hot-air incubator will have appeared, it being already in type. The Rearer article will follow shortly. For your other queries, get your bookseller to procure indexes of Vols. I. and II., and look up what you want. All back numbers can be obtained at the usual price. For rates of Sale and Exchange column, consult the current or any issue.—LEGHORN.

Gesso Work.—SCULPTOR.—Materials for gesso work can be obtained from the Society of Artists, 53, New Bond Street, W. Directions for the use of the composition are given on the tins. To commence the art, gesso composition is all-sufficient; but if large pieces of work are in hand, artists generally make their own gesso of the finest possible plaster of Paris, rubbed down with water to a batter, and glue or resin added.—C.

Glaziers' Diamonds.—A. R. (*Askett, Bucks*).—Evidently the address you want is Messrs. James Nicholson & Co., Glass, Lead, Varnish, etc., Merchants, 214, Upper Thames Street, E.C. If it is not, then you had better write again, when no doubt our obliging Editor will insert your request. As you may not be able to wait so long, and in case the above is not the correct one, I here give two other addresses of makers of glaziers' diamonds—viz., Messrs. Sharratt & Newth, 43 and 44, Percival Street, Clerkenwell, and Mr. Fred Biddle, 4, Percival Street.—H. S. G.

Milling Machines.—F. G. (*Erith*).—The best book on this subject is "The Mechanician and Constructor," by Cameron Knight, published by Spon at 18s. But there is nothing in it on milling machines, neither will you be able to get any work on that subject. Any specific queries on this subject would, however, be answered in WORK.—J.

Axle.—G. S. (*Hollinwood*).—Axle-trees are only fitted to mail or collinge axles, and there is no altering the pitch; but when the common arms are used, they are set into a bed, and to get the right pitch so as to allow the wheels to knock and run sweet, we do what is commonly known amongst wheelers as "gaiting" them. First get the bed planed straight and true, then set the arms at each end of the bed. We will suppose that we are fixing the arms in the bed for the hind wheels, 4 ft. high, cart fashion. We therefore get the straight-edge and place it across the felloes at the front of the wheel, then measure the space between the face of the spoke on the nave and the straight-edge, which we will suppose to be 2 in.; keep the straight-edge in this position and measure the distance at the other end of the same spoke near the felloe. Whatever this measurement may be, it must be deducted from the first measurement. If the latter was 1 in., it therefore leaves 1. The secret of gaiting a wheel lies in allowing a small ¼ in. hook from the string to the shoulder of the arm off every inch we measure from the dish of the wheel. Therefore, in this case it will be a ¼ in. hook, the arms being let into the bed until this measurement is attained.—W. P.

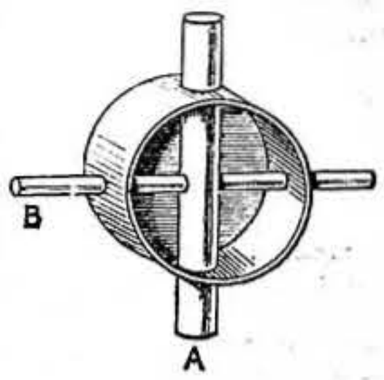
Filling.—W. C. (*Peterhead*).—Patent filling is now too well known amongst painters, having superseded ochre, formerly used for filling up. The advantage of the patent filling over ochre is that it makes a more solid ground to work upon, besides requiring less labour in rubbing down. The following is the recipe for mixing the filling:—Mix 4 lbs. of patent filling and 2 lbs. of best white tub lead into a paste with turps; place into a can, and thin down with 1 pint of turps, ½ pint of gold size, and ½ pint of jobbing carriage varnish. When it is well mixed up it is ready for use, and can have from one to two coats daily. The carriage must only have this filling applied upon those parts which show, and should have a couple of coats of lead colour before the filling is applied, the last coat being stained with Indian red or rose-pink, to guide you when rubbing down. When the last coat is put on, leave for a couple of days to dry, and when rubbed down let it stand for another couple of days for the water to evaporate out of the filling. When thoroughly dry, give it a coat of lead colour and proceed painting the carriage.—W. P.

Weight of Copper.—AMATEUR.—A square foot of copper ⅛ in. thick weighs 5·75 lbs.; a square foot, ⅛ in. thick, 2·87 lbs. The method of making the port-holes in a model cylinder depends on the size of the cylinder. Anything over about ⅝ in. or ¾ in. bore is *cored*, the shape of the core-box being governed by circumstances; smaller cylinders have their ports drilled.—J.

Getting Gold off from Gilt Buttons.—J. K. (*Mile End*).—String the buttons on a platinum wire, immerse them as an anode in a solution composed of one part of potassium cyanide in ten parts of water, and pass a current through the solution from a strong battery to a strip of gold forming the negative pole in the solution, until all the gold is dissolved off the buttons. Then evaporate all the water from the solution, and dry and fuse the salt in a plumbago crucible with an equal bulk of dry carbonate of soda. The crucible must be kept at a white heat for several minutes. The button of metal thus obtained will be an alloy of gold with brass.—G. E. B.

Silvered Glass.—J. B. (*Doncaster*).—As I understand your questions, you wish to know where you can buy a small quantity of silvered glass in Doncaster; also if there is a firm in Hull. (1) I do not know where you can get silvered glass in Doncaster; but nearly any cabinet-maker will supply an amateur; and although, perhaps, you may have to pay a slightly higher price than if you bought of a manufacturer, still you can very often get better served, as large dealers do not care to be bothered with very small orders. (2) As regards Hull, I think you will be well served if you apply to Messrs. Primrose & Co., Glass Merchants, Hull. I may say it is very near the Paragon Station—in fact, just outside. To fill up cracks in oak, try resin and beeswax, melted together and tinted to proper colour with burnt umber and Dutch pink: or, if you prefer it, putty, tinted to match.—W. E. D.

Winter Electrical Machine (Prime Conductor and Glass Rod).—DRAUGHTSMAN.—You ask for the address of a firm supplying brass bedstead knobs suitable for the ball of the prime conductor of the above-named machine. Messrs. Noyes & Co., Old Street, St. Luke's, London, could supply you with brass bedstead knobs; but the largest size kept in stock is 2½ in. in diameter, which is scarcely large enough for the purpose, as it would look out of proportion to the Winter ring attachment. Knobs of the size required are to be obtained in Curtain Road; but I fear that you would have to purchase the bedstead as well, which would make it come expensive. If you state your wants to Prof. Caplatzi, The Science Exchange, Chenies Street, Tottenham Court Road, London, I believe that he will be able to supply you with a brass ball made specially for the conductor of this class of machine. Should you experience any difficulty in obtaining a brass ball of the diameter needed, you could employ, as a makeshift, a brass box in place of the ball. This should be made from a 2½ in. length of brass tubing, 3½ in. in diameter, with a disc of the same metal neatly soldered on to the open ends of the tube. A 6-in. length of ¾ in. tube is now put through the box from side to side, as shown at A in the accompanying diagram; and an 8 in. length of stout ¾ in. tube is soldered crosswise through the box, as shown at B, the tube being inserted through holes drilled in the centre of the larger tube. Finally, a small quantity of soft solder is run all round the junctions of the tubes, care being taken not to plaster the solder about, as this would mar the appearance of the whole work. The solder should be cut up into the form of very small beads, which are just flushed round the joints by means of a few puffs from a blowpipe. The subsequent operations, including the attachment of the collecting rings, must be carried out in precisely the same way as if a ball were employed for the conductor. It is, of course, highly important that the outer surfaces of the metal should be carefully cleaned up and left with a perfectly smooth and even surface, free from dents or imperfections. If you are not handy at brass-work, you have yet another alternative plan of making the prime conductor. You can turn a ball in a lathe from a block of sound, dry wood, and then insert the conducting fittings in the usual manner, and afterwards cover the entire surface with tinfoil or gold-leaf. Tinfoil, which would be the best to use, should be cut into the form of a series of longitudinal strips, similar in form to a section of an orange, which are then pasted on to the surface of the ball, and smoothed down until quite smooth by means of a piece of soft wadding and a bone paper-knife, or the handle of a tooth-brush. Glass rod and tubing of all sizes can generally be obtained from an electrician in any large town; or, if you experience any trouble in getting it, you might send to Prof. Caplatzi, stating the diameter and length required, which will be cut off and charged for at the rate of 1s. per lb.; or, if you prefer to go to the fountain-head, you can obtain it from Mr. D. Williams, experimental glass blower, Beech Street, Barbican, London, who deals in glass rod and tubing, and is a manufacturer of chemical and scientific glassware, including incandescent lamps, thermometers, etc.—C. A. P.



Prime Conductor of Winter Electrical Machine, with Side removed, showing Arrangement of Interior—A, B, Brass Tubes.

Zither.—W. J. (*Belfast*).—I replied to W. J. a short time ago on the above subject, giving him full information thereon; but it appears from his question, as now put, that he has not made a zither proper at all, but only one of the toy kind, better known, perhaps, as "Prince of Wales's harp," for which, of course, my instructions are useless. As, however, the instrument, even considered as a toy, is, especially if well made, capable of producing very sweet sounds, it is quite worth the trouble of stringing up properly. To do this, the following steel wire should be used: first and second strings (commencing from the bottom, or longest), No. 12; third and fourth, No. 11; fifth and sixth, No. 10; seventh and eighth, No. 9; ninth and tenth, No. 8; eleventh and twelfth, No. 7. If the first of these are rather "twangy," it will be as well to substitute covered strings (copper on steel), such as are used for the fourth and fifth of the zither proper. The tuning is a very easy matter, the scale being the ordinary "diatonic" scale; and it, of course, limits the tunes capable of being played on it to those standing within its compass, and containing no "accidentals," either sharp or flat. If these instructions are not sufficiently explicit, and W. J. will write again, giving the dimensions of his instrument, and, if possible, a rough sketch, I shall probably be able to assist him further; but he must not be so impatient at not getting a reply *at once*. He must remember that "big wheels move slowly," and "Shop" has now become a very "big wheel" indeed; but not so big but that his "spoke" will surely come round in time.—R. F.

Acid and Gilding.—AN IMPROVER.—*Hydrofluoric acid* is the name of the chemical compound used by glass writers, which has the property of disintegrating or eating into glass and kindred substances. This is the article which has been in use for many years for embossing, the parts to remain clear being eaten out to a lower level than the original surface of the glass, which latter is then obscured by grinding with emery and a glass slab. This should only be used with plate-glass. *White acid* is a comparatively modern invention, and is a compound which not only eats into the glass, but *obscures* the same in one action; it can, therefore, be used for sheet-glass, and is really a tremendous advance upon the "old fluoric" for many purposes connected with glass embossing. For further useful particulars, see previous answer to "Acid and Gilding" in present volume. The exact proportions used in making isinglass mordant, or size, for glass gilding, is a matter on which there is no necessary unanimity of opinion. The true theory of the process is this: that the mordant is only a temporary expedient to enable us to manipulate the gold; to gild and "double gild," and hold it in position until, by hot bath washings, we are able to dissolve it from its place and leave the gilding in perfect contact with the glass. This process, which is really the pith of the burnishing, is difficult to succeed with until practice and experience have been paid for by the inevitable failures and renewed and conquering perseverance. My advice is, therefore, to use only as much *finest* Russian isinglass as will cover a shilling; to put this into a new and thoroughly clean glazed earthenware pot (the London painters' "hand pot," or the best substitute you can get); pour over it a pint of boiling filtered water; then, as an extra precaution, when quite dissolved, strain through silk or the finest fabric you can get it through; and, finally, be sure glass, brush, and everything else are scrupulously clean. Many writers add to their size an equal quantity of spirits of wine; this is neither necessary nor advantageous. The most fruitful causes of failure and disappointment in obtaining good burnish are these: using foreign-beaten gold out of ordinary rouged books; using the size too strong; insufficient washing; improperly cleaned and greasy glass, tools, etc.; and *want of experience and practice* most of all.—F. P.

Polishing Marble.—J. S. F. (*Swindon*).—As your query evidently refers to a piece of real marble, you will find the surface polish will be renewed by taking a little rotten-stone (finely pulverised), and rubbing the slab with this and a small piece of fine marble or stone. Work with a circular motion, using water only if it is a light marble; but, if black, sweet oil may be substituted for the water, which fluids are, of course, used in conjunction with the polishing slab and rotten-stone. Time and patience are also required in considerable proportions.—F. P.

Colouring Figures.—CLAUDE.—The only method I can suggest for colouring the small plaster figures after the manner you desire, is to dip them into a solution of the ordinary dyes. Cheap dry pigments, such as Venetian red, French ultramarine blue, and raw sienna (in water), would, if fine in quality, make coloured fluids which would dye the plaster; but some of them would not "bind" as firm as the chemical dyes, nor would the action be so regular as the latter solutions. Why not colour the plaster by mixing it with coloured water? Have you tried this?—F. P.

Stain and Arches.—E. B. C. (*Cheltenham*).—I do not know that there is anything recognised as *the* stain (green) for furniture. Get some green dyes, and select the one which gives the colour you like best. Plenty of shades are to be got. I hardly understand your inquiry about arches, but any outline can be cut with a bow-saw. Perhaps this hint may help you; but if it does not, write again, giving us a little more idea of what you mean by Moorish arches for corners of rooms.—D. D.

Employment.—J. A. N. (*Portsmouth*).—If you want to improve yourself, and get employment in a cabinet shop, why not try those in your own neighbourhood? WORK is very glad to help anyone on; but, really, it can hardly become a labour agency; and I daresay you know the saw: "Heaven helps those who help themselves." Go about among the cabinet-makers in your own and neighbouring towns, and keep your eyes open for a vacancy. If you were in a remote country village, it might be meet to write you differently; but situated where you are, you have more chance of finding a place to suit yourself than you would have by travelling to any town we might tell you of. How would you like, for instance, to be told that you might get into a shop in Liverpool or Edinburgh, and when you got there find that the foreman could not estimate your abilities at what you might consider a fair value. Whether you could bind yourself for a year's service would depend very much on your employer. If you are a smart,

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handy man, where would be the use of doing so? and if you are a duffer, your employer might object. Without knowing your work, it is impossible to say what would be suitable wages. You might be cheap at 30s. a week or dear at 10s.—D. D.

Bleaching Wood.—J. T. H. (*Liverpool*).—I am not aware of any steaming process by which such woods as maple and sycamore can be bleached and made white; but you may lighten almost any wood by washing it with a solution of oxalic acid in water. From your memorandum heading, though, I imagine it is not worth while in your business to take much trouble in making the wood white. Possibly chloride of lime might do all you require. If you will write again, and let us know more particulars, we may be able to advise you more definitely what to do. Meanwhile, remember that oxalic acid is a deadly poison; so be careful with it.—D. D.

Wheel.—DOUBLE GLOSTER.—When making a new wheel to go with, and match, an old one, you will have to cut out a felloe pattern. Cutting from, or using, an old felloe will not do. First measure the height of the pattern wheel, not including the tire, then place a piece of pine ½ in. thick upon the floor and describe a circle ½ in. higher than the pattern wheel with trammel or compasses; next measure the thickness of the felloes, and if much worn by repeated re-tireing, make the new felloes ½ in. thicker at least. We therefore reset our trammel 2, 2½ or 3 in. as required, and draw another circle within the outer one. If the wheel has 10, 12, or 14 spokes in it, we divide this circle into 5, 6, or 7 equal parts, each part or arc representing a felloe. Be sure that a felloe is described and marked out upon the board. We now saw this pattern out and mark upon it the height of the wheel it represents. We then lay it aside, and get the iron hub or nave and place it in the pit frame, illustrated and described in No. 15, Vol. I., of WORK; with the nave being cast or malleable iron it will be ready mortised. We shall, however, require a face-stick or spoke-boy; this is a staff, and is screwed to the front of the nave so that it works stiffly about. At the top end, or nearly so, a piece of whalebone, or cane, is inserted through a hole and plugged tightly to keep it from shifting when dishing the spoke. First get a piece of wood and drive it into the bush at the front of the nave, then screw the face-stick or spoke-boy at the lower end to the centre of this plug. To set the whalebone, or cane, right for dish, we place a straight-edge across the face of the hub or nave, then measure the distance between the front of the spoke near the felloe and the straight-edge. Whatever this measurement may be, we let the whalebone, or cane, protrude from the face-stick, bore a hole with a shell-bit the same distance up the stick as the top end of the spoke near the felloes is from the nave in the old wheel, then set the whalebone right and plug tightly, to keep from shifting when once set. When the spokes are dressed off the same as the old ones—excepting the tangs, or tenons, which we do not touch at present—we commence to drive them in; get a spoke and pare it down until it fits the mortise easily, as it will tighten the further it is driven. Hold the spoke-boy at the front, and see that the face of the spoke only just touches the end of the whalebone, or cane, then drive the spoke home; these spokes must be driven in alternately, and not one after the other, or the nave will split. When driving a spoke in always have it perpendicular—the face-stick can be worked round to each spoke without unscrewing it. When all the spokes are driven in we lay the wheel down, letting the nave rest upon a block face upwards; then measure from the top of the nave to the top of the felloe on the pattern wheel; then get a staff one end wedge-shaped, so that it will touch the nave between the spokes. At this measurement, from the nave to the top of the wheel, we mark upon the staff, and insert a sharp bradawl and scratch the spokes all round, afterwards sawing the superfluous away. Next measure the thickness of the felloe; if 2 in., insert the bradawl 2 in. lower down, and mark each side and back of the spokes; we are now marking them off for tenons. If the wheel is a light one you are making, the tenons will be round; if a heavy cart wheel, they will be square. If round, we saw with the tenon-saw round the spoke—more at the back and front than the sides; whatever the strength of the tenon is to be, we get an auger and bore a mortise hole through a piece of oak 1 in. thick (this same auger must bore the felloes). When all the spokes are sawn round, place the wheel in the pit frame, then place the piece of oak on the top of the tenon and mark with pencil; pare the tenon down until the mortise pattern fits it; serve all the other tenons the same. We lay the wheel upon the block again face upwards, and get our felloes ready; if you buy them ready sawn you will say what size of a wheel you intend making; and when you get them, plane one side up straight and true, then place the felloe pattern upon it and mark with the pencil; then saw and chop off the superfluous, using the square often. When all are marked in this way we place them upon the wheel, letting the felloes rest upon the tenons; the joints of two felloes always come in the centre between two spokes; if the felloes do not fit, we take a little joint out until the rim is complete. Next run the pencil at each side of the tenon, thus marking the felloe; then number the spokes and felloes to correspond when putting together; also draw a straight line across the joint; get a felloe and mark with the square from this line, then set your gauge for the centre and also mark and bore for the mortises. Then, after the mortises have been bored, we have an inch or so at the end of the joint for a dowel hole; these dowels will be 2 or 3 in. long, oak pegs or round iron ones. Now dress the felloes off the same as the old pattern, then insert a dowel at each end of a felloe and knock them on. Next insert the chisel in the tenons—not horizontal, but perpendicular—and wedge the tenons up with good oak wedges. We now give the wheel a coat of paint, and when dry send it to be hooped; when the tire has been put on we dress the rim of the wheel all round, back and front, near the hoop, and also the joints; then paint it, and your wheel is made. In Vol. II., in "Shop" (p. 225), will be found sketches illustrating making and putting a wheel together.—W. P.

Organ Matters.—T. W. (*Gamesley*).—You ask how you can lighten the touch on the upper row of keys which you have fitted to your organ. As shown in the sketch which accompanies your query, it would appear that the keys have no independent connection with a second manual, but merely press down the keys of a lower manual by means of a plunger placed under the fore part of the keys. If this is so, I think the touch could easily be lightened by weighting the fore part of the upper row of keys with lead weighting, so that they almost press down the lower row, only requiring a slight touch to cause them to act. The weighting could be inserted in the keys in the same way as it is done for the purpose of balancing them. Or you could secure the same end by placing a spring over the fore part of each key, one end of the spring being on the key, and the other end fixed in a spring rail about 2 in. above. The sketches will

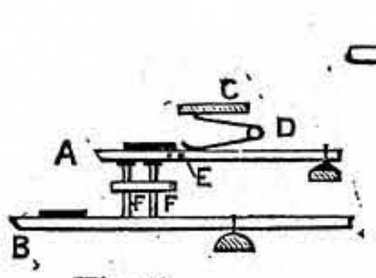

Fig. 1.

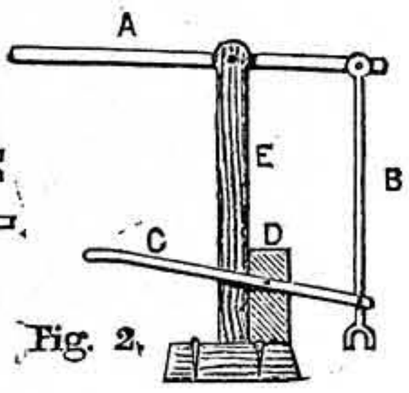

Fig. 2.

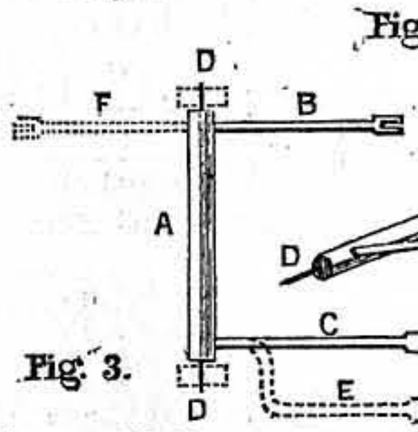

Fig. 3.

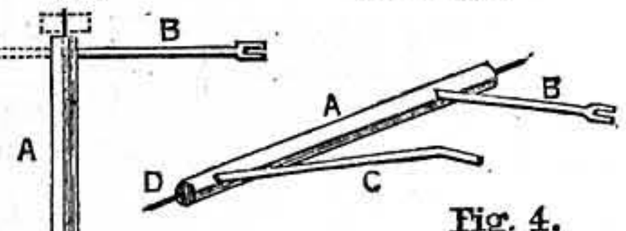

Fig. 4.

Organ Matters. Fig. 1.—A, Upper Keys; B, Lower Keys; C, Spring Nail; D, Spring to press down Keys; E, Lead Weighting; F, Plungers. Fig. 2.—A, Hand-Blowing Handle; B, Lug; C, Suggested Foot-Blower; D, Block for centring Foot-Blower; E, Standard. Figs. 3 and 4.—A, Roller; B, Back Arm with Lug; C, Front Arm with Pedal Plate; D, Centre Pins and Blocks; E, Suggested Bent Arm for Pedal; F, Suggested Arm on reverse side of Roller.

explain how this is done. Either of these plans could be tested by trying the weighting or spring on a single key. You also ask how you can adapt a foot-blower to the organ, so that you can be independent of a hand-blower, who is not always available when you require his services. Have you tried a pedal, working on a centre pin on the same standard as the arm of the hand-blower, the further end being loosely pinned on to the lug of that blower, as shown in Fig. 2? If necessary, a block could be screwed on to the standard, so that the pedal blower could be centred nearer to the lug, and thus obtain greater leverage and lighten the foot pressure required. The pedal could be bent round so as to bring it within easy reach of the foot. If this plan is not practicable, then it will be necessary to adopt the roller system, which is shown in Figs. 3 and 4. A stout roller, centred on a strong pin at each end, is placed cross-wise under or near the end of the bellows, and close to the floor. At the front end of the roller is an arm, carrying a pedal plate; and if this arm is not to be entirely in front of the casing, it must be bent, as shown in the dotted lines of Fig. 3. This arm is made to slope upwards, and another arm is fixed to the further end of the roller, sloping very slightly downwards, and having a lug, or a little wheel, at its free end, so that it will either be pinned to a connection with the under-side of the feeder, or will press against the same part of the feeder. The roller and arms can be made of wood or iron; the latter would, of course, be strongest, and take up least space. The arms can be both on the same side of the roller, or on opposite sides, according to the position in which it has to be fixed under the instrument; and this will, of course, depend on the amount of room available, so that it may not interfere with any of the action. It can be made to work with either right or left foot, as required, according to the positions of the arms on the roller; and, of course, the longer the pedal arm the more leverage.—M. W.

Musical Box Combs.—J. B. (*Kennington*).—You did a most foolish thing by unscrewing the flyers or fan part of musical box. Had you read the chapter on musical boxes, you would have seen that the driving part containing mainspring must be at rest—no pressure on the barrel with pins in it. I stated it clearly, so that no one could make a mistake. The same accident has resulted in the destruction of hundreds of good boxes. I see it is some time ago that this occurred, so it is evident you have not seen the pages of WORK. So many of the teeth are gone, that repairing is out of the question; and if you will look at the barrel with a magnifying-glass, you will see one tune destroyed—that is, the pins that acted on the teeth of comb will be bent, and lots broken. That you can remedy (see chapter on Musical Boxes), but you will require a new comb; and if box has the maker's name upon the card—which it will have—also the *number* of box, you can get a new comb to exactly fit and with the least trouble; it will be Geneva, Switzerland, as no one in England sells them. The cost will be about 25s. to 30s.; carriage extra.—J. S.

Cloth Paint.—D. M. (*Glasgow*).—If you had stated the nature of your fabric, and your chief reason for desiring to paint it, I might more definitely have replied. I do not, however, think you can better a mixture of "boiled oil"—viz., boiled *linseed* oil and patent paste driers, such as is used for sailors' oilskins, etc. A little pigment might be added to colour the mixture, if desired, or even a little white lead; but the paint should only well saturate the cloth and not lie on the surface, or else you will get a film that will crack. About 1 lb. driers to 1 quart boiled oil.—F. P.

Pine Polishing.—C. A. (*Birmingham*).—To stain and polish your pine chest of drawers in imitation mahogany, you cannot do better than proceed as follows: (1) Stain the job with the brown or walnut stain of vandyke brown, ammonia, and water. Mind that this stain is only to be a weak one, not by any means so dark as if the wood were required to be finished walnut colour. (2) Fill in with a mixture of turpentine and whiting, coloured with a little Venetian red. Rub this well in, and clean off all the surplus before (3) bodying in with ordinary French polish, reddened with Bismarck brown. Be careful not to use too much of the Bismarck brown, as it is a very powerful colour. About a pinch of it to a pint of polish will be sufficient. (4) Finish off with a mixture of equal quantities of French polish and glaze, applied with a tolerably wet rubber. This method of finishing will probably suit you better than spiriting off, as it is both easier and quicker. You may as well buy the French polish and glaze ready-made. In justice to the French polisher, whom you fancy wanted to overcharge you, I may state that the figure you name is by no means excessive. Of course, if it is more than you wished to pay, you need not have the work done by him; but you must remember that polishers have to live by their trade, and you could not expect him to do your chest of drawers without a reasonable remuneration. When you have done the job, just reckon how much materials have cost you, and the number of hours you have spent on it, and then, by assessing your time at a very moderate value, you will see there is not much change out of 7s. 6d. To this add the reflection that if the work had been done for you it would, probably, have been far superior to what yours—as you are a novice—can possibly be. This leads me to say that as you have never done any polishing, if you make your first attempt on your chest of drawers, you need not be surprised if you spoil the job. Try first on a piece of waste wood, just to get your hand in, and to get some idea of the tints.—D. D.

French Polishing.—J. E. (*Blackhill*).—If you have done "fairly well" with your escritoire, without having had any previous experience in polishing, or more knowledge than you have been able to pick up from hints in "Shop," I am inclined to say that you have done not fairly only, but very well. Without practice, you could not expect to get the polish "up to the mark" like an experienced polisher would; so I think you have every cause to be satisfied. Of course you will do better as you proceed, and from your letter you seem to have somewhat misunderstood the various operations. You will do better by using methylated spirits only in finishing. Of course, the bodying in, or what you call the last coating, must be dry before you spirit off. You will have observed that the body polish dries very quickly, and even if you tried, I do not think you could spirit off while it is wet. The spiriting is merely done to remove the streakiness left by the polish rubber; so that, you see, there is no necessity for doing it till the last thing. If you body up well, several coats of polish are not necessary, though there may be no actual harm in them. A good deal depends on the nature of the work in hand.—D. D.

Polishing.—W. R. (*Newcastle*).—The fine little cracks on the polish of your piano are caused by what is technically known as sweating, *i.e.*, either the grease which may have been in the composition of the filling, or oil, used in the polishing process, has sweated through the thin coating of shellac. The cracks, or sweating, become visible from the dust which settles on the oil. Therefore, the disfigurement caused can almost entirely be averted by carefully wiping new furniture now and again with a soft damp cloth. When the oil has done exuding, which may not be for some months, the work may be re-polished with advantage. Sweating is not entirely preventible. Possibly you might be able to remove the dirt with warm water and a little

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soap; but it will be better for you to use a reviver, composed of vinegar, raw linseed oil, and methylated spirit, in about the following proportions, which, however, need not be closely adhered to: ½ pint of vinegar, 1 noggin of spirit, and a tablespoonful of oil. Use this on a piece of soft rag, and a small amount of rubbing will remove all the sweating. To touch up the parts where the black has been worn off, use some black polish, made by mixing gas black with ordinary French polish. Go over the bare parts with this by means of a rubber till they are sufficiently ebonised, finishing off in the usual way. You must remember that you will probably have to go over the whole job with polish to prevent the newer portions looking different from the old. If the work is properly done, the case of the piano ought to look as good as new. Of course, if you like to do so, you may re-stain; but as this involves removing the whole of the present or existing polish, you will probably prefer the simpler method which has been indicated. If your piano is a valuable one, you had better employ a skilled French polisher to do what is necessary.—D. D.

Brass Water Aspirator.—WATER ASPIRATOR asks O. B. to give a few measurements of the brass water aspirator described in WORK, Oct. 24th. In reply to this, I think it will be sufficient to say that Messrs. M. and S.'s instrument, in glass, is about 8 in. long. The illustration given, though not drawn to scale, supplies, with this one measurement, sufficient data, I think, to construct such an apparatus.—O. B.

Capacity of a Tank.—W. C. (*Deptford*).—To find the capacity of a square or oblong tank, multiply the length in feet by the breadth in feet by the depth in feet. This gives the capacity in cubic feet, and if multiplied by 6·2321, the capacity in gallons. Example:—A tank 10 ft. long by 4 ft. wide by 6 ft. deep will hold (10 × 4 × 6 =) 240 cubic feet of water, or (240 × 6·2321 =) 1495·704 gallons. To find the capacity of a round tank, multiply the depth in feet by the square of the radius in feet by 3·1416. This gives the capacity in cubic feet, and, if multiplied by 6·2321, the capacity in gallons. Example:—A tank is 5 ft. high, and has a diameter of 8 ft.; the radius, which is half the diameter, will therefore be 4 ft., and this, squared, is (4 × 4 =) 16 ft.; therefore, capacity equals (5 × 16 × 3·1416 =) 251·328 cubic feet, or (251·328 × 6·2321 =) 1566·3 gallons. One cubic foot of water equals 6·2321 gallons.—F. B. C.

Size of Cylinder of a 1-Horse Engine.—J. H. (*Lower Broughton*).—No one can tell without knowing also the rate of revolution and the average pressure during the stroke. Also, it is not the length of the cylinder inside, but the stroke of the piston which you require to know. You will find all this fully explained in No. 106 of WORK. If, however, you mean, not an actual horse power, but a nominal horse power (a conventional term by which engines are sold, and has very little to do with the power they can exert), then you can obtain the information from the price-lists of engine-makers, striking an average; for they will not exactly agree. Looking at the price-list of Hindley, of Bourton, Dorset, I find he allows for a 1-horse engine a cylinder of 3 in. diameter and 4½ in. stroke. To show you how little that has to do with the actual horse power, I may say that, supposing this engine would exert 1-horse power when supplied with steam at 50 lbs. pressure, then it would exert 2-horse power if worked with 100 lbs. steam. If, again, it gave 1-horse power with 50 lbs. steam at 100 revolutions per minute, then it would give 2-horse power at 200 revolutions. You see that, by doubling the pressure and the speed, you could quadruple the power: the same 1-horse engine might give 4-horse power; so that the size of the cylinder alone is misleading.—F. A. M.

Camera.—BELLOWS ON THREE LEGS.—Instructions for making this and the tripod stand appeared in the following numbers of WORK: 13, 23, 29, 70.

Mail Cart.—A NEW READER.—You will find that instructions for making this appeared in No. 30 of WORK.

Safety Bicycles.—WEEDLESS.—Consult the following numbers of WORK: 107, 111, 115, 119, 124, 127, 132, 137.

Training.—A. H. (*Hyde*).—WORK is not the channel for the questions you ask. Consult the Editor of *Cassell's Saturday Journal*.

Cart-Wheel Making.—WOOD-WORKER.—These papers are in preparation.

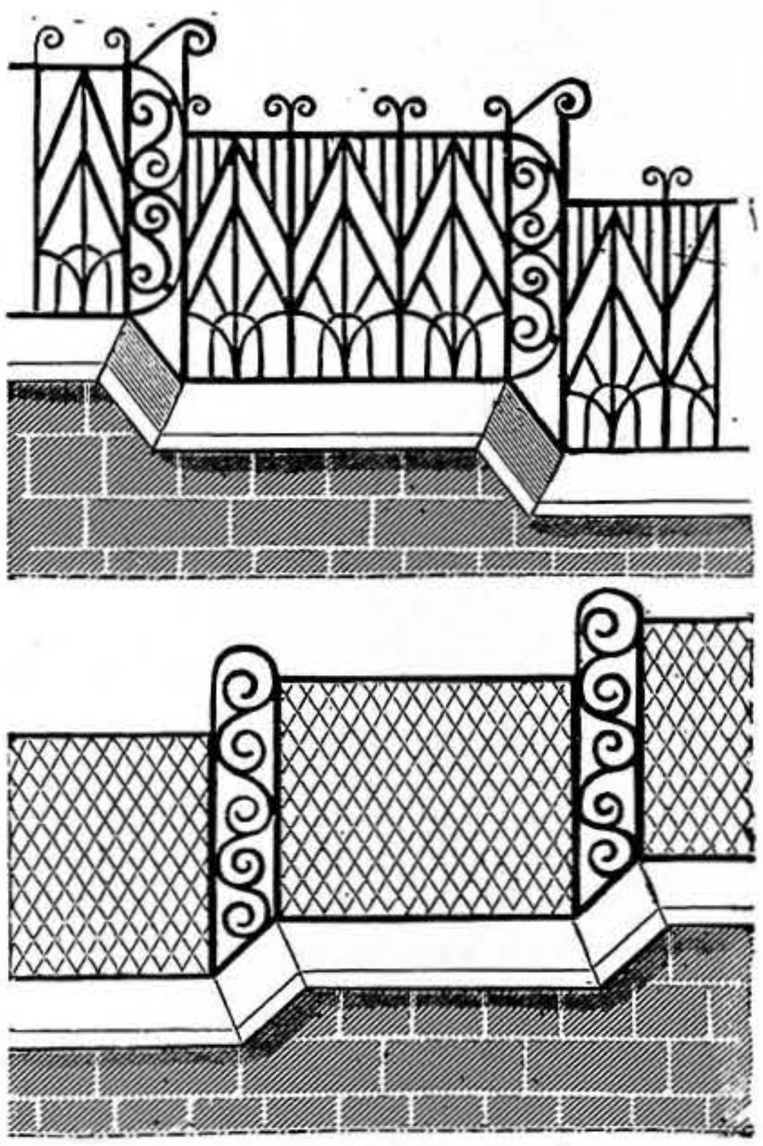
Lathes.—E. J. T. B. (*Barnet*).—Refer to the following numbers of WORK: 2, 3, 4, 6, 8, 10, 14, 17, 40, 45.

Model Locomotive.—A. E. (*Cardiff*).—You and all correspondents should repeat your questions when writing about replies which have not appeared.

Overmantel.—R. H. H. (*Shutter Oak*).—The demands on space in WORK are far too great to admit of the appearance of another overmantel of any kind at present. See back numbers.

Weather Glass.—PETERBORO'.—I may say that the glass (⅛ in.) mentioned in the article (see No. 135, page 483) should be procurable at any operative chemist's in almost any town. But if you cannot get it thus, you can certainly get any quantity from Messrs. Reynolds & Branson, Commercial Street, Leeds, or from any other dealer in scientific apparatus. But I do not think that any of these dealers will supply less than 1 lb., for which quantity the price is 1s., plus 3d. postage. I take this opportunity of suggesting a further improvement in the construction of the glass. I find that the greatest difficulty is in making the joint tight between the tube and the bottle. I have just constructed another glass, and have used one of the new screw-stoppered ale bottles. These have a capacity of half a pint (nominal), and for 4d. I get a caoutchouc bung, ¾ in. at the smaller end, with one hole through. Now, by wetting this, it may be firmly and tightly screwed into the neck of the bottle; and, by wetting the tube before insertion, a perfectly air-tight and flexible joint may be made. This I find to be a very decided improvement over the method I described in the article.—J. G. L.

Wall Wire-Work.—BETA.—I will not now give you full satisfaction, for the very good reason that to here publish sufficient explanatory notes (as you ask for) concerning the wire fencing with which you wish to adorn your wall would fill more space in "Shop" than I could conscientiously cover. Perhaps you know that my special branch in connection with WORK consists of furniture designing. But a series of articles upon Wire-Working have appeared, through the instrumentality of a practical friend, at the Editor's request. I must, therefore, ask you to be good enough to refer to them, if you think of doing anything in this line yourself. It will be some time, however, before they are complete; for, although some correspondents are under the impression that subjects they desire ought to be furnished at the instant they are asked



Wire Fencing Designs.

for, some period must necessarily elapse while all the articles are being written and drawn, then printed, then engraved, and a place found for them. To not thoroughly disappoint you, I have given two designs suitable for fencing for your wall, which, you say, has two ramps. I shall henceforth describe the putting together of the diamond wires as shown. I should advise you to have the fencing in three separate parts, with thick scroll wires soldered together, or iron scrolls between them. I should certainly not let the top line of fencing follow the line of the wall, as then you would fail to obtain any character in it. While you are waiting, remember that "patience is a virtue."—J. S.

Provisional Protection (Patents).—F. G. W. (*Hackney*) is, perhaps, confounding *Registration* with Provisional Protection. The stamped form for the latter costs £1. Of course, no patent agent can work for the mere price of the stamp; his fee must be paid in addition. If F. G. W. wants his work done gratis, he must do it himself; and how to do it he may learn from the article, Vol. I., p. 545.—C. C. C.

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—G. L. (*Westminster*); MARINE GLASS; W. M. (*Dundee*); R. G. (*Settle*); S. W. C. (*Leicester*); H. W. (*Norwich*); C. G. M. (*Penistone*); A. S. (*Farringdon Road*); G. T. (*Hollinwood*); R. R. F. (*Frome*); GARTAR; A. J. (*Edinburgh*); G. G. (*Llandudno*); E. McN. (*Gateshead*); RALPHO; REX; G. F. R. (*Bournemouth*); A GUNMAN; W. L. F. (*Dublin*); L. W. (*Islington*); G. J. W. (*Ballymena*); C. J. (*Leeds*); M. (*Bishop Auckland*); R. B. (*Egremont*); MECHANIC; CHOPSTICK; J. P. (*Liverpool*); W. S. W. (*Leeds*); "WORK" READER; J. B. T. (*Manchester*); EDIFRA; W. McK. (*Elgin*); A. W. (*Parsonstown*); YOUNG ENGINEER; J. T. S. (*Sheffield*); T. G. & SON (*Sheffield*); SPARK; A. D. (*Monkwearmouth*) LEEDS ENGINEERS' ASSOCIATION; E. H. S. (*Corfe*); W. H. (*Portobello*); A. M. B. (*Dublin*); J. S. (*Amsterdam*); J. A. (*Halifax*); F. H. (*Battersea*); J. R. *Glasgow*.

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